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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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THE
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Vol. 25 NEW YORK, FEBRUARY, 1927 No. 2

Annealing of Metals and Alloys in the Electric Furnace

A Discussion of the Types of Modern Electric Furnaces for Bright and Open Annealing, and Their Operation

By R. M. CHERRY

Industrial Engineering Department, General Electric Company, Schenectady, N. Y.

In the annealing of copper, to give relief to mechanical strain for drawing, rolling, forming, etc., a satisfactory anneal can be obtained by heating to a temperature from 300 to 650 deg. C. (572 to 1202 deg. F.), although the lower temperatures of this range will not give a change in the grain arrangement in a practical annealing time. To obtain an anneal of the maximum softness, a temperature of approximately 650 deg. C. is required.

It is essential, when annealing for drawing, etc., that the temperature at any point in the charge reaches 300 deg. C. (572 deg. F.) as a minimum, that the maximum temperature at any point is kept below a temperature that will injure the metal and that no reducing gases are present in the furnace.

The presence of reducing atmosphere causes imbrittlement of copper containing oxygen, and practically all copper used contains oxygen. The extreme sensitiveness of the action of reducing atmospheres on heated copper is very well shown by the tests conducted by Mr. T. S. Fuller.*

A large part of the copper wire, tubes, etc., is being bright annealed in non-oxidizing furnaces, which eliminates all pickling and loss of metal because of oxidation.

Two types of electrically heated non-oxidizing furnaces are shown in outline in Figs. 1 and 2, and similar furnaces are shown in Figs. 3, 4, and 5; a typical automatic control panel is shown in Fig. 6.

BRASS

To give relief to mechanical strains for drawing, rolling, forming, etc., a satisfactory anneal is obtained by heating to a temperature of approximately 500 to 600 deg. C. (932 to 1112 deg. F.), depending upon the composition of the brass and type of anneal; that is, rough or finish anneal. The finish anneal requires close temperature control and uniform temperature throughout the furnace, which is most satisfactorily obtained in the electric furnace.

It is essential that the temperature at any point in the charge reaches as a minimum the required temperature for anneal and that the maximum temperature at any point is kept within a few degrees of the minimum temperature.

* Mr. T. S. Fuller, "The Extreme Sensitiveness of the Action of Reducing Atmospheres Upon Heated Copper."—G. E. Review No 3, Vol. 25 (March, 1922), pp. 184-188.

For rough annealing the temperature range should be fairly close to insure good workability of the brass.

In finish annealing the temperature range for annealing should be very small in order to secure the proper grain size, hardness and workability. The maximum temperature variation in the charge may be as low as plus or minus 5 deg. C. (9 deg. F.).

Such close control is only possible in an electric furnace

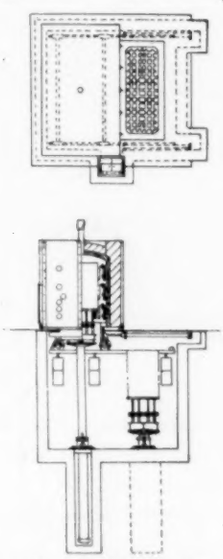


FIG. 1. KENWORTHY CAR TYPE FURNACE

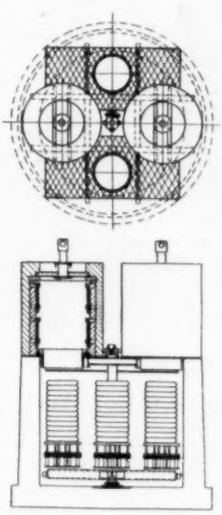


FIG. 2. KENWORTHY TWIN CHAMBER ROTATING FURNACE

in which the heating units are properly located, distributed and controlled.

In the electric furnace the heat source (the heating element) is a low temperature heat source. That is, the temperature of the element is only a few degrees above that of the furnace temperature, which is essential for close control of the temperature throughout the charge.

In the furnace operating at 600 deg. C. (1112 deg. F.) the temperature of the heating element will be approximately 650 to 700 deg. C. (1202 to 1292 deg. F.),

In an oil fired furnace, the temperature of the heat source may be 1200 deg. C. (2192 deg. F.) or higher.

With such a high heat source part of the charge, especially the edges, may be "burnt."

Reducing atmospheres will cause some embrittlement of the brass but in a less degree than in copper because of the zinc present.

It is not possible to obtain a perfect bright anneal of brass in a non-oxidizing furnace as there will be a slight

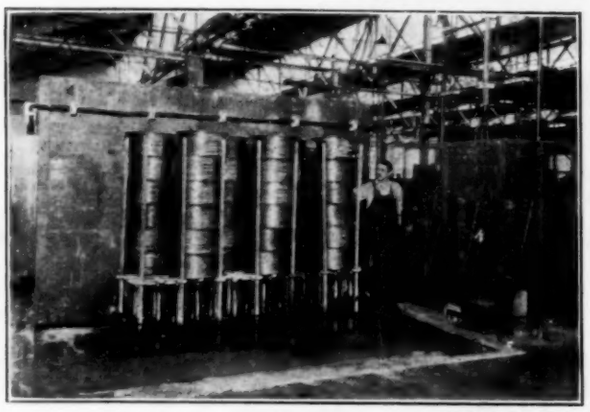


FIG. 3. FURNACE FOR BRIGHT ANNEALING COPPER WIRE

discoloration. This discoloration is in no way objectionable except in the finished product where a light pickling will be required.

In practically all brass mills the brass is annealed in the open type pan furnace. An outline of a typical elec-

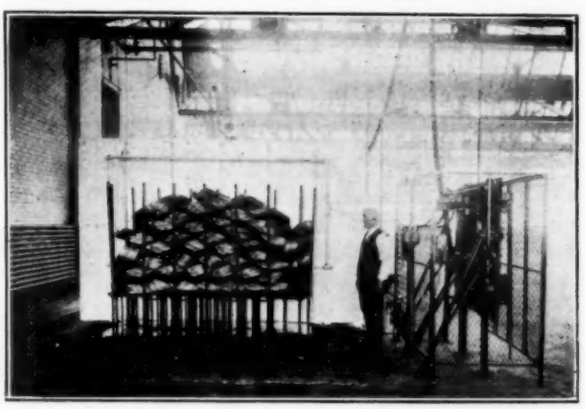


FIG. 4. CAR TYPE NON-OXIDIZING ANNEALING FURNACE

trically heated pan furnace is shown in Fig. 7 and an installation of two similar furnaces is shown in Fig. 8.

OTHER METALS AND ALLOYS

Gold, silver, aluminum, and nickel silver, zinc alloy

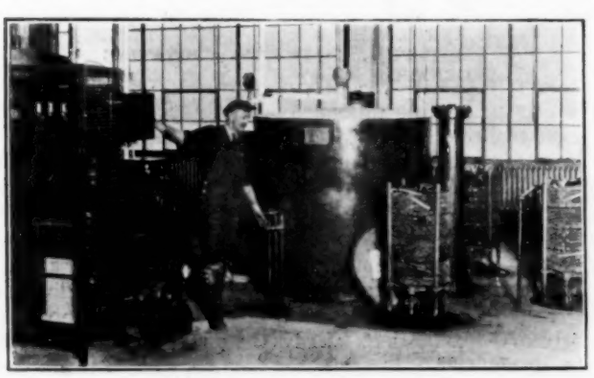


FIG 5. KENWORTHY BRIGHT ANNEALING FURNACE

(usually used for table ware) are most satisfactorily annealed in the electric furnace.

The nickel silver zinc alloy, when annealed in a non-oxidizing furnace will be slightly discolored, because of zinc, but as is the case with brass, this discoloration is not objectionable except for the finished anneal when a light pickling will be required.

The temperature at which aluminum is usually annealed

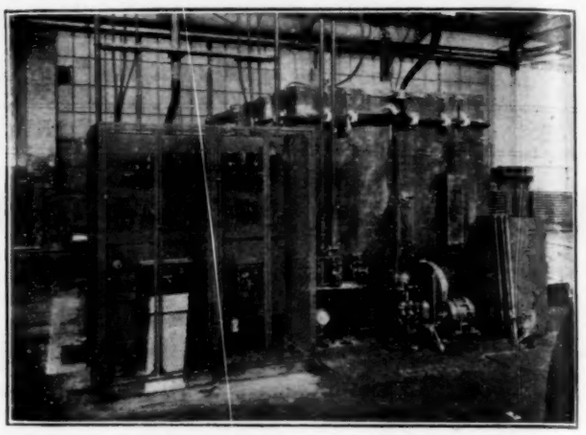


FIG. 6. ELECTRIC FURNACE FOR BRIGHT ANNEALING

is so close to the melting point that it is imperative that the temperature be uniform throughout the furnace and accurately controlled.

TYPES OF FURNACES AND OPERATING DATA

The type of electrically heated non-oxidizing furnace shown in Figs. 1, 2, 3, 4, and 5, is water sealed at the bottom. Dry steam is used in the furnace chamber. A

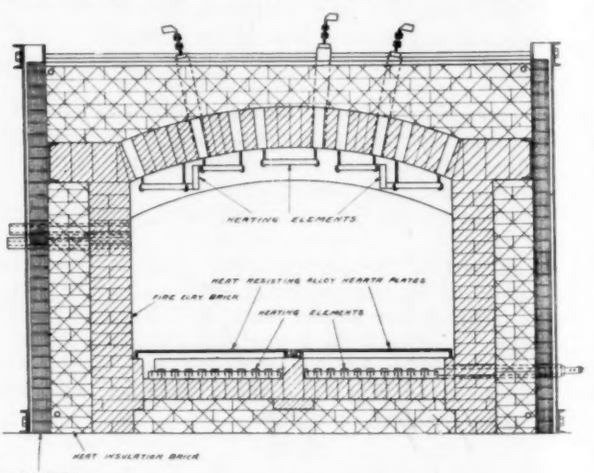


FIG. 7. OUTLINE OF PAN TYPE ELECTRIC BRASS ANNEALING FURNACE

very low pressure is maintained in the future so that no air can enter. A pressure in the furnace sufficient to keep the butterfly valve (at top of furnace) open slightly, is all that is needed. The walls of the furnace consist of a firebrick lining with approximately 9 inches of good heat insulation between the firebrick and outside casing. A non-corrosive metal lining with brazed joints is placed between the firebrick and insulation to prevent moisture from penetrating the insulation and thus greatly reducing its insulating qualities.

No muffle or retort is used and the heating elements are mounted in the furnace chamber free to radiate heat direct to the charge. This elimination of the retort re-

duces the expense of maintenance to the minimum.

The application of electric heat for annealing non-ferrous alloys is very light service for the heating element and the element will last indefinitely. It is interesting to note that there has not been a failure of a heating element in any of the electrically heated non-oxidizing furnaces, and several of these furnaces have been in continuous operation for the last four or five years.

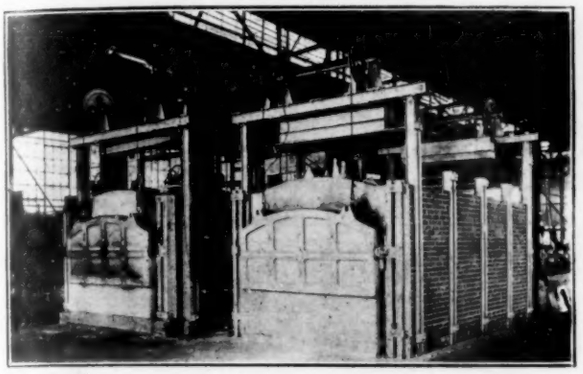


FIG. 8. BATTERY OF TWO ELECTRIC ANNEALING FURNACES.

The maximum temperature reached in the electric furnace is never high enough to injure the fire brick lining, and the brickwork, therefore, will also last indefinitely.

TABLE NO. 1

Tests on Samples of Copper Wire Taken from Top, Center and Bottom of Charge Annealed in Kenworthy Non-Oxidizing Furnace

Setting of temperature control instruments 600° C.
Charge withdrawn from furnace when temperature of charge reached 300° C. minimum.

Sample		Copper Wire Diameter	Tensile Strength Lbs. Per Sq. Inch	Elong. in 10" %	Number Bends 90 Deg.
.128-A	Top	.127	35,000	41.2	13
-B		.1265	34,100	37.1	13
.128-A	Center	.129	35,500	33.0	10
-B		.128	35,600	32.9	10
.128-A	Bottom	.128	35,200	36.0	18
-B		.128	35,300	41.0	13
.057-A	Top	.057	36,900	35.0	18
-B		.057	36,500	37.5	17
.057-A	Center	.057	36,900	36.5	21
-B		.057	35,700	30.0	18
.057-A	Bottom	.057	35,700	34.6	11
-B		.0575	35,000	39.0	17
.078-A	Bottom	.0775	35,100	37.0	23
-B		.078	35,800	39.2	23
.064-A	Top	.064	35,700	40.0	32
-B		.064	35,700	33.0	26
.081-A	Center	.081	36,900	35.7	17
-B		.081	37,000	34.5	18

In table No. 1 data on mechanical tests are given for several sizes of wire taken at top, center, and bottom of a charge of copper wire heated in an electrically heated non-oxidizing furnace. The temperature setting of the control instrument was 600 deg. C. (1112 deg. F.). The charge was withdrawn from the furnace when a minimum temperature of charge reached 300 deg. C. (572 deg. F. —Time of anneal approximately one hour.)

The economy (meaning th pounds of metal annealed per kilowatt-hour of electric power, and so used throughout this paper) of this type of furnace when annealing copper wire in coils will be approximately 15 to 25 lbs. of copper per kilowatt-hour, depending on the size of furnace, weight of charge, duration of anneal and temperature.

The furnace in Fig. 3 has an annealing space of 36 inches wide by 96 inches long, by 51 inches high, which will take a charge of approximately 10,000 lbs. of copper in coils.

To determine the economy of this furnace it is necessary to calculate or obtain by test the total heat losses from the furnace, heat absorption of the charge and platform, and the loss due to interchange of charges.

A SAMPLE CALCULATION FOR ECONOMY

Given a furnace as above; that is, with a 36 inches wide, 96 inches long and 51 inches high annealing space; a charge of 10,000 lbs. of copper wire in coils, and assuming the duration of anneal to be one hour and twenty minutes, time required for interchange of charges to be 15 minutes and temperature control intrument actuated at 600 deg. C., (1112 deg. F.), then the total heat losses, including losses through walls of furnace, loss through bottom of furnace, and loss carried out by the superheated steam are 79 kilowatt-hours per hour, determined by actual test at 600 deg. C. (1112 deg. F.). The loss from interchange of charges (in addition to losses mentioned for the 15-minute period) is 24 kilowatt-hours, determined by test.

The absorption of the metal is determined by the formula

$$\frac{\text{Lbs. of metal} \times \text{specific heat} \times \text{temp. rise in °F}}{3412} = \text{kilowatt hours.}$$

The 3412 being the B.t.u.'s in one kilowatt hour and the specific heat being the average specific heat be-

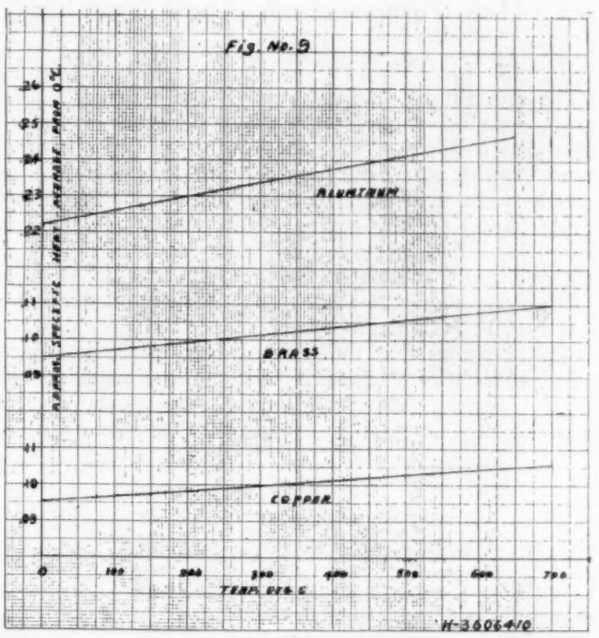


FIG. 9. AVERAGE SPECIFIC HEATS OF COPPER, BRASS AND ALUMINUM

tween the temperature of the metal when it enters the furnace and final temperature.

Fig. 9 shows the average specific heat. Assuming that the average final temperature of the charge is 500 deg. C. (932 deg. F.) and that temperature of charge entering furnace is 20 deg. C. (68 deg. F.) and substituting known quantities in the above formula, we have:

$$\frac{10000 \times .103 \times 864}{3412} = 261 \text{ kilowatt hours.}$$

Knowing the weight of platform (steel), the absorption is calculated in the same manner. For this size furnace the absorption is approximately 50 kilowatt hours.

Therefore, the total consumption of electric power will be:

	Kilowatt hours
Total losses for 1 hour 35 minutes (79 × 1.583) =	125
Loss from interchange of charges	24
Absorption of copper	261
Absorption of platform	50
Total electric power consumption per charge	460 kilowatt hours

Therefore, the economy $= \frac{10{,}000}{460} = 21.75$ lbs. of copper per kilowatt hour.

With a cost of electric power of 1 cent per kilowatt hour, the cost of electricity for annealing will be 4.6 cents per 100 lbs., of copper. (A rate of 1 cent per kilowatt hour is used for easy transposition to any other rate.)

In making the heat loss test on this furnace, it was found that the heat carried out by the steam was 35 to 40% of the total losses, which means that the minimum amount of steam which will give satisfactory results should be used.

When annealing copper wire wound on reels, the economy is less than when annealing in coils, because of the extra weight of the steel reels, and because of the fact that, for a given size of furnace, it is not possible to load the furnace as heavily with copper on reels.

Using a furnace 36 inches x 96 inches x 51 inches, the economy when annealing wire on reels will be approximately 14 to 17 pounds of copper per kilowatt hour.

ANNEALING OF SMALL THIN WALL TUBE

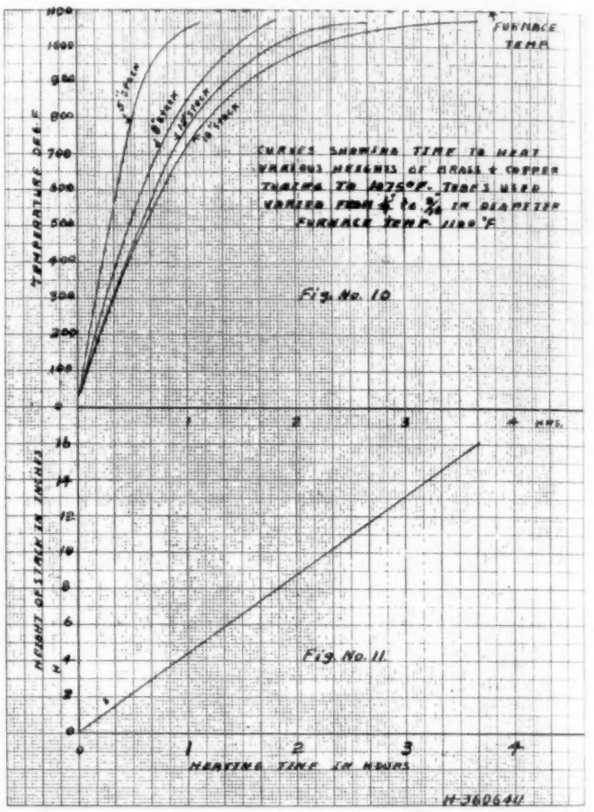
The annealing of tubes presents the problem: What is the economical stacking? Tests have been made to determine this point, and the results of these tests are shown by the curves in Figs. 10 and 11. The temperatures as plotted in Fig. 10 were measured by a thermocouple located at the center of the stack. The heating elements of the furnace used were mounted under the arch and under a heat-resisting alloy hearth. The top and bottom elements were independently controlled at 1100 deg. F. (600 deg. C.)

Fig. 11 shows that the time of heating varies directly with the height of stack within the range of stacking used in these tests. Therefore, the economical stacking, as far as heating is concerned, will be the maximum height of stack that can be used without danger of injury to tubes.

PAN TYPE BRASS ANNEALING FURNACE

Recently a large brass mill installed two electrically heated pan type furnaces. (Fig. 8.)

The working dimensions of each furnace are 6½ feet wide x 17 feet long x 2½ feet high. The connected load is 300 kilowatt hours, 220 volts, 3 phase, divided into two independently controlled circuits of approximately 150 kilowatt hours, 220 volts, 3 phase, each. The location of the heating units is shown in Fig 7.


FURNACE TEMP.
CURVES SHOWING TIME TO HEAT VARIOUS HEIGHTS OF BRASS & COPPER TUBING TO 1075°F. TUBES USED VARIED FROM 4 TO ¾ IN DIAMETER
FURNACE TEMP. 1100°F
Fig. No. 10
Fig. No. 11
TEMPERATURE DEG. F
HEIGHT OF STACK IN INCHES
HEATING TIME IN HOURS
H-360640

FIGS. 10 AND 11. CURVES SHOWING TIME TO HEAT VARIOUS HEIGHTS OF BRASS AND COPPER TUBING TO 1075° F.

Data on seven consecutive heats taken under ordinary

TABLE NO. 2

Heat No.	1	2	3	4	5	6	7
Time charge entered furnace	8:52 p. m.	10:10	11:22	12:34 a. m.	1:45	2:50	4:00
Time charge withdrawn from furnace	10:00	11:18	12:30 a. m.	1:41	2:42	3:58	4:57
Lowest temp. (°C) reached by furnace after charge entered furnace	570	530	595	605	585	550	590
Furnace temp. (°C) at time of withdrawal of charge	700	690	705	700	650	675	665
Temp. (°C) of metal at time of withdrawal	540	595	580	595	540	567	560
Class of metal	Copper coils 12½ x 0.50" 105 lb.	Brass coils No. 7 B. & S. 4⅝ x 5⅛	Copper coils 11½ x 0.50" 60 lb.	Brass coils 5⅛ x 0.0105" 90 lbs.	Brass coils 4⅝ x 5⅛" 90 lb.	Brass coils 5⅛ x 0.028 90 lb.	Brass coils 5⅛ x 4⅝" 0.008
Weight of metal (lbs.)	6,090	9,800	5,250	4,590	9,810	7,470	6,390
Weight of steel pans (lbs.)	850	850	540	540	850	850	850
Duration of anneal in minutes	68	68	68	67	57	68	57
KWH. consumed	252	294	252	213	294	294	252
Economy lbs. net of commercial metal per KWH	24.1	33.6	20.8	21.6	33.4	25.6	25.3

operating conditions when "rough" annealing are given in Table 2.

The kilowatt-hour consumption as given in Table No. 2 for the individual heats is not exact, for the kilowatt hour consumed per heat made a small change on the watt hour meter dials. The total kilowatt-hours (1851) consumed for the seven heats is accurate within close limits.

The economies obtained in heats No. 2 and 5 are considerably higher than for the other heats. This is because of the extra weight of the charge; also, probably the average temperature of the charge was lower and furthermore, the kilowatt-hours consumed may not be absolutely accurate, as already explained.

The average economy for the seven heats (49,400 lbs. of brass) is $\frac{49400}{1851} = 26.7$ lbs. of brass per kilowatt-hour.

With the furnace of this type and size, the average economy will be from 20 to 27 lbs. of brass per kilowatt-hour, depending on the size of charge and duration of anneal.

With electricity at 1 cent per kilowatt-hour the cost of electric power for annealing will be from less than 4 to 5 cents per 100 pounds of brass.

A test to determine the heating time for a finished anneal and the temperature distribution was made on a furnace approximately 5 feet wide, 24 feet long and 2½ feet high. The data are given in Table No. 3 and Fig. 12. This test shows the temperature distribution obtainable in a properly designed electric furnace.

TABLE NO. 3

Data Showing Temperature Distribution and Heating Up of Charge of Brass (in Coils) for Finish Anneal. Readings in Degrees C. Thermocouple Number

Time	1	2	3	4	5	6	7	8
1:55				Charge Placed in Furnace				
2:00	570	590	205	110	160	85	175	120
2:14	595	605	335	240	275	175	295	225
2:30	590	608	465	382	385	290	405	340
2:46	600	610	540	485	475	400	480	420
3:00	590	598	570	530	518	470	520	485
3:16	590	600	585	565	550	523	550	525
3:30	590	600	588	580	565	550	565	553
3:45	595	602	590	588	575	570	578	570
4:00	592	595	592	592	585	582	585	582
4:10	590	592	592	592	585	585	585	585

Stereoscope Readings. Edge of Strip 9. Center of Strip 11.
Refer to Fig. No. 12 for Location of Thermocouples

The electrically heated pan type furnace has not only given a very uniformly annealed product but its operation has also brought about other savings such as less oxidation, thereby a saving in pickling and in metal, and the possible elimination of one or more anneals in the entire process of rolling to final thickness.

The close automatic temperature control and the uniform heat distribution in the electric furnace gives accurate duplication of uniform anneal, day in and day out. The assurance of the duplication of results is one of the principal items in connection with any furnace.

This feature is of such great value that it has been sufficient reason for the adoption of the electric furnace for non-ferrous annealing by more than one large manufacturer.

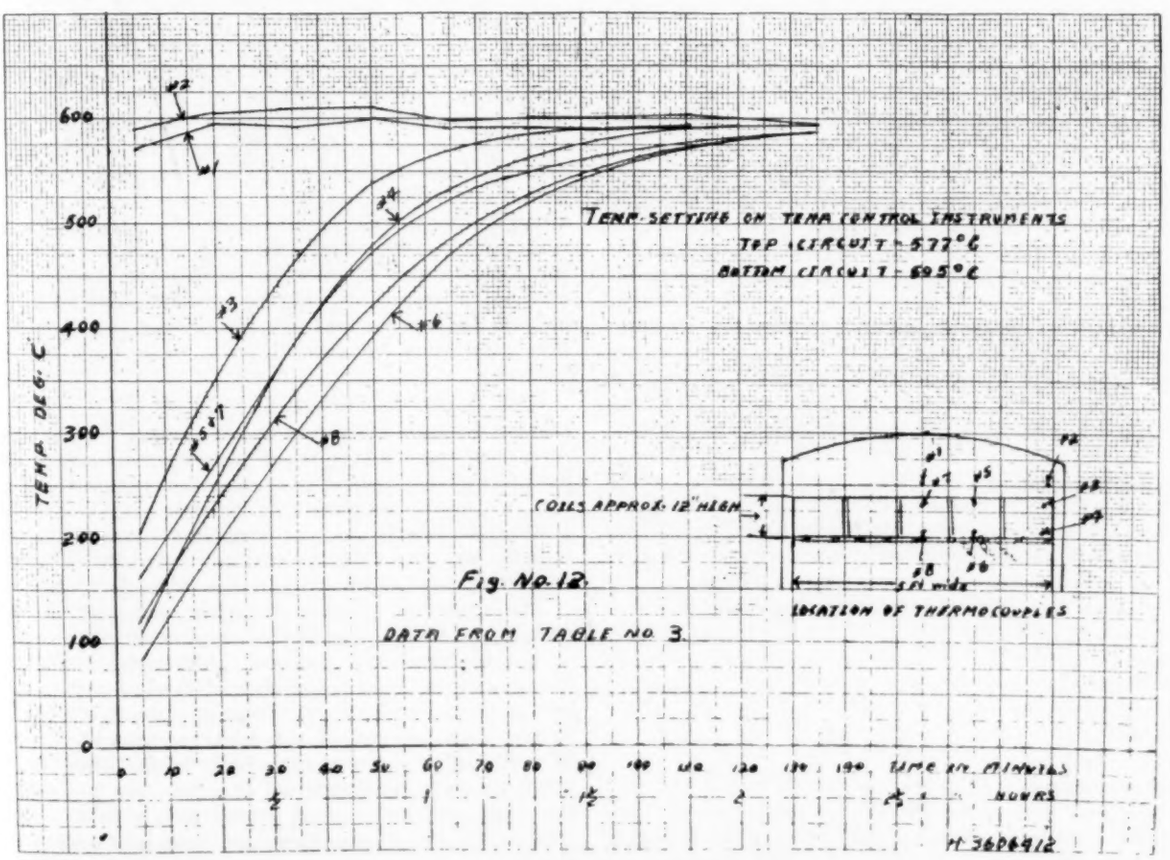


FIG. 12. CHART OF DATA FROM TABLE 3

The Production and Refining of Remelted Zinc

A Description of Modern Practice in Producing Good Zinc from Scrap

Written for The Metal Industry by EDMUND R. THEWS, Metallurgist

One of the most important branches of the scrap metal industry is the production of remelted zinc and guaranteed —quality—zinc from old and new zinc scrap. While the specifications for ordinary grades of remelted zinc usually are sufficiently liberal, and exceptional care is not required for its production, the manufacture of guaranteed zinc, containing at least 98 per cent of zinc and the least possible amounts of tin, iron, and copper, necessitates close attention to the smallest details, as well as the use of special refining methods not generally known to the trade. As a rule, guaranteed zinc is made from the best of new zinc scrap consisting of bright, new sheet zinc scrap free from all soldering seams, etc. This method, while giving very fine results in a technical way, is not recommendable, since much larger profits may be attained by using a certain large percentage of ordinary old and dirty scrap, like zinc, bath tubs, etc., which in modern melting practice and by the application of proper refining methods may be brought to a degree of purity of well above 98 per cent zinc, containing less than 0.10 per cent Fe as well as very small amounts of tin and copper.

REVERBERATORY VS. IRON POT METHOD

Remelted zinc may be produced in reverberatory furnaces and in melting pot furnaces, although the former melting appliance is gradually being abandoned in favor of the latter, the unimportant and by no means certain advantages of the reverberatory furnace being more than neutralized by the considerably higher initial costs and running expenses as well as by a number of serious technical deficiencies.

The main advantage claimed for the reverberatory furnace is said to be the fact that in contrast to the melting pot process the hot zinc does not come in contact with iron walls, thus eliminating the inavoidable contamination of the zinc with iron. This contention, while true in principle, does not do justice to actual conditions, however. Whilst in the first place the solubility of the iron of the walls of the pot may be much decreased by using pots of suitable material, preferably steel, by washing the inside of the pots with certain preparations, and by applying correct working methods, melting in the reverberatory furnace does not necessarily mean the elimination of iron, since, as every practical man knows, all zinc sheet scrap, or any other kind of zinc scrap is contaminated more or less with iron particles, which offer a much larger surface to the corrosive action of the zinc than the walls of the melting pots, and which for this reason will doubtlessly give up more iron to the zinc. Since, in reverberatory furnaces, heat is applied to the surface of the bath almost exclusively, and since in working the metallic bath the iron particles are moved to and fro violently in this hottest zone of the furnace, solution of iron from the scrap is surely much more pronounced in the reverberatory furnace than in melting pots where the upper part of the metallic bath is the coolest, of course.

Another important feature to be considered is the fact that the metal should be poured at temperatures considerably lower than the most efficient melting temperatures. In reverberatory melting the latter temperatures are of necessity the average temperatures of furnace and bath, no consideration being given to the lower pouring temperatures. It would prove to be rather difficult indeed to fix and maintain a uniform temperature suiable to both requirements, that is to say, a temperature representing approximately both, the lowest possible heat for melting and the highest possible heat for pouring the metal, whilst on the other hand it is practically impossible to change the temperatures of furnace and bath at will. The brickwork of the furnace is soaked with heat which by radiation and conduction is communicated to the zinc, so that after melting down the metal hours would pass before the temperatures have been reduced to the most efficient pouring temperatures. For this reason reverberatory zinc, if melted at sufficiently high temperatures, is always poured at temperatures too high to show really good surfaces and fractures. In order to avoid this, many reverberatory furnaces are fitted with one or even two forehearths—iron or steel melting pots—thus eliminating, of course, the main advantage claimed for the furnace whilst retaining all the disadvantages possessed. That is, the surface of the zinc bath is constantly exposed to the oxidizing action of the hot gases of combustion and the sheet scrap charged is heated to high temperatures in the air before melting and entering the bath.

SINGLE AND TWIN POT SYSTEMS

In remelting the zinc in melting pots—by the single pot system—the difference in melting and pouring temperatures is regulated automatically if the process is carried out correctly. In pouring zinc, but a small portion, about 5 cu. in., is ladled out at one time, the lower main portion of the bath being kept as quiet as possible in order not to disturb the layer of lead accumulated at the bottom of the pot. Now, throughout the pouring period the metallic bath is gradually heated up to and above melting temperatures whilst after charging has been resumed the temperature is gradually lowered to pouring temperatures again. By suiting the amount of raw material charged and of the amount of remelted zinc poured to the various conditions, temperature regulation may thus be carried to a very high degree of accuracy.

Best results are obtained, however, if the process is carried through in "the twin pot system," where the difference of temperature required is attained simply enough by heating the second pot, used for refining and pouring, to lower temperatures than the first pot of the systems in which the zinc is melted down. The operation of the two different melting pot systems and their respective advantages will be described later on.

The separation of lead from the remelted zinc in the melting pots is in no way inferior to that accomplished in the reverberatory furnace. Although in the case of the single pot system the characteristic disadvantage inherent to pot melting, viz., the comparatively high heat of the lower portion of the metal, counteracts separation of zinc and lead from each other, this difficulty is in a large measure overcome by the twin pot system where the main amount of lead separates out in the first pot whilst the rest of the free lead contained settles out in the second.

The author has developed a method of improving the

process of separation and of preventing the separated lead from reentering the zinc by air cooling the bottom of the pot as shown in the sketches. Figs. 1 and 2.

In this construction the firing is not installed beneath the pots but side by side and on the same level with its sidewalls, the firing gases encircling the walls which for this purpose are drawn out more than is usual even with the deep pots used for the production of remelted zinc. This arrangement of plant permits the products of combustion to be drawn through a channel passing below and around the bottom of the pot, lowering considerably the temperature of the bottom layer of lead.

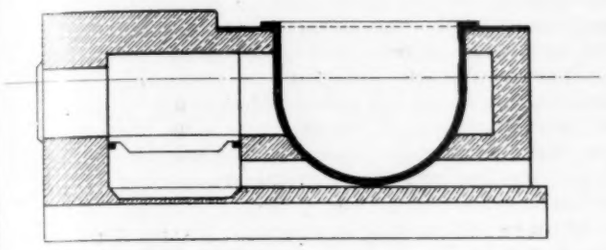


FIG. 1. AIR COOLED ZINC POT—SECTION

VAPOR DISPOSAL

An apparent advantage of reverberatory melting over the melting pot process is the relative freedom of the surrounding atmosphere from the disagreeable vapors evolved by the tar and other organic impurities adhering to the surface of the sheet scrap, troughs, spouts, etc. Whilst there can be no question as to the advantage of this feature, this is due to the very grave disadvantage of the reverberatory furnace above indicated, viz. the comparatively high temperature of the furnace above the surface of the metal, causing the combustion of large quantities of the vapors evolved and a more rapid exit of the gases into the flue. As far as this advantage is due to the larger cross section and drawing capacities of the flues, similar results may, of course, be attained with melting pot plants by increasing the cross section of the flue pipes. Indeed, I have found that in all cases which have come to my attention the flue pipes of the hoods of the pots were entirely too narrow to take care of the large amounts of smoke and vapor invariably evolved in melting zinc scrap. The diameter of the flue pipes of zinc melting pots should never amount to less than 15 in. whilst the hoods themselves should be made considerably larger than those of ordinary white metal melting pots. With the same intensity of draft, equal cross section of flues and correct working methods the smoke and vapor nuisance in the melting pot plant is by no means more pronounced than in the reverberatory furnace, where the organic substances adhering to the scrap are evaporated much more quickly and where, consequently, the generation of the vapor clouds is much more sudden and voluminous.

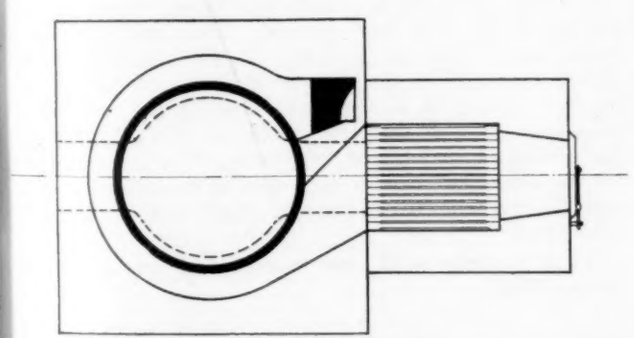


FIG. 2. AIR COOLED ZINC POT—PLAN

MELTING POT CONSTRUCTION

For the purpose of assisting the separation of lead, zinc melting pots are made considerably deeper than ordinary melting pots. Whilst the depth of the ordinary white metal pots amount to 6-8 inches more than the length of the radius of the upper cross section, zinc pots should be made about 12-16 inches deeper than the length of radius of the upper cross section of the pots.

If the bottom of the first pot of a twin pot plant is air cooled, the depth of the pot should be increased by 4 to 8 in. in order to increase the heating surface which in this case is restricted to the side walls only, and to further assist in the separation of lead from zinc. Air cooling the bottom of the pots also offers the advantage of permitting a tap to be affixed to the bottom of the pot through which the lead accumulated there may be tapped at regular intervals.

COMPOSITION OF MELTING POTS

Too much attention cannot be paid to the composition of the iron material of the pots, a fact which is but little recognized by most producers. Cast iron pots are being used almost everywhere, a dense surface and fairly good finish being the only requirements put up by the purchasers whilst no consideration whatsoever is paid to the question of composition. There can be no doubt that this fact alone is responsible for the extraordinarily strong corrosion of the melting pots in the production of remelted and guaranteed zinc. The iron material used for pots of this type must be as tough and elastic as possible and must be able to withstand the corrosive action of the firing gases as well as that of the zinc. Of the many different compositions proposed for this purpose, the following, has proved to be the most resistant:

Total Carbon	3.00%
Combined Carbon	0.40%
Manganese	2.00%
Silicon	2.00%

Sulphur and phosphorus should be present in least possible quantities.

The resistance of the above composition against prolonged heating and overheating is largely increased if 30 per cent of hematite is also added. Particular attention is here called to the fact that the skin of the castings is much more resistant against all corrosive influences than the iron proper, so that all machining of the pots should be carefully avoided.

Incomparably better results are obtained by using steel pots for the production of remelted and guaranteed zinc. A good quality steel, particularly in presence of a few per cent of maganese and chromium will successfully withstand the corrosive action of zinc and the refining agents used as well as that of the firing gases. Although the price of steel averages about 50 per cent higher than that of iron this difference is made up by the fact that the walls of steel pots need not nearly be as thick as those of cast iron pots. Instead of a cast iron zinc melting pot with 1.8 in. walls, for instance, a steel pot with 1.5 in. or even 1.3 in. walls may well be used, which will last at least twice as long as the former at but a few per cent increase in cost.

The corrosive influence of the zinc and the sulphur gases used in refining is decidedly lowered by washing the inside walls of the pots with milk of lime at regular

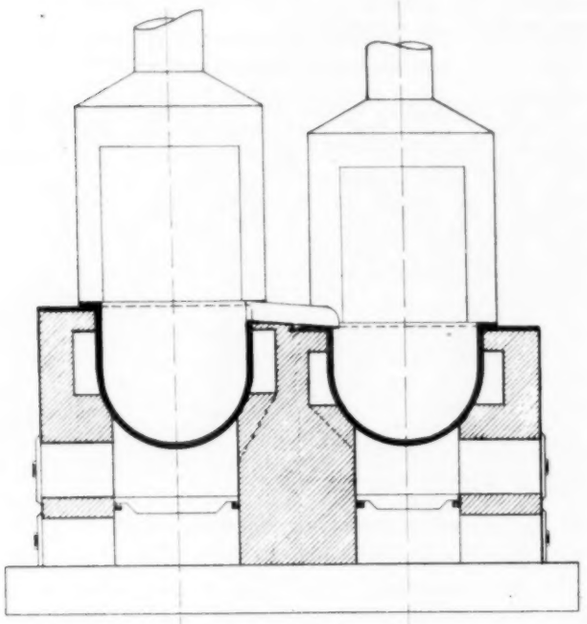


FIG. 3. TWIN POT SYSTEM FOR MELTING ZINC

intervals. A particularly effective wash is produced by mixing milk of lime with a sufficient quantity of finely ground graphite.

ADVANTAGES OF THE TWIN POT SYSTEM

Of the two melting pot systems for the production of remelted zinc by far the best results are achieved with the twin pot system shown in Fig. 3, where the zinc scrap is melted in the first pot whilst the remelted or refined material is ladled out of the second pot into which it is led by a trough. The advantages of the twin pot system are the following:

(1) Continuous operation. Charging of scrap is not interrupted by pouring periods. The scrap is charged continuously by one man whilst another man takes care of the pouring.

(2) Better separation of lead and correspondingly higher purity of the finished product. Most of the lead contents of the raw material settles down in the first pot where it is not disturbed by any mechanical or refining treatment of the metal. Additional separation takes place in the second pot where the lower temperatures of the metallic bath increases considerably the tendency of the lead to settle out.

(3) Correct melting and pouring temperatures. For sufficiently rapid melting the temperature of the metal in the first pot is held at about 975-1025° F, whilst the temperature in the working and pouring pot is kept constant at 875° F.

(4) An outstanding feature of the twin pot system is its suitability for the production of quality zinc, that is to say, for the refining treatment—sulphurizing and steaming—of remelted zinc. Whilst in working with the single pot system, steaming and boiling with sulphur will constantly stir up and cause reabsorption of lead by the zinc, the main amount of lead settling out in the first pot of the twin pot system is not disturbed in the least. On account of the relatively small amounts of lead separating out in the second pot and the comparatively low temperatures, working the zinc bath does not influence separation very much; so that a few minutes after the end of the refining treatment all separable lead will have settled out and pouring may be commenced.

REMOVING SOLDERING SEAMS

Unless absolutely new and bright sheet zinc scrap free of soldering seams, etc., are used as charge, all the raw material melted should first be suitably dressed. The importance of this fact is rarely recognized, even the oldest and most rotten roof sheet scrap being charged without paying any attention to removable impurities. Indeed, this practice is usually encouraged by the attitude of most purchasers of remelted zinc who, besides specifying white color and a smooth, dense surface of the slabs, rarely inquire into the chemical composition of the remelted zinc.

In order to produce a remelted zinc of good quality the lower grades of scrap should be judiciously mixed with certain percentages of the better qualities and heavy soldering seams cut out. None but the absolutely new and bright zinc sheet scrap should be reserved for the production on quality—guaranteed—zinc. This material mixed with the better grades of old scrap freed from tin solder will give an exceptionally good grade of zinc similar in quality to original smelter zinc.

Very little can be said at present regarding the comparative efficiency of the different methods used for the removal of soldering seams. The different mechanical cutting apparatus suggested for this purpose may only be used economically for treating sheets and, perhaps, troughs, whilst for zinc containers, such as bathing tubs, zinc boxes, etc., the oxy-acetylene burner or a sort of electric boring tool may be used. This latter apparatus resembling closely the ordinary electric boring apparatus differs from this in the peculiar development of the boring tool which in this case acts as cutting implement. In using the oxy-acetylene torch, a strongly reducing flame must be maintained, of course. The slight amount of zinc oxide vapor evolved as well as the whitish coloration of the edges of the cut need not be seriously considered.

This article will be completed in an early issue.—Ed.

Cleaning Core Boxes

Q.—We are using aluminum core boxes in our brass foundry. We find that after we bake cores in these boxes several times, a coating forms on the surface of them. This coating causes considerable trouble in the sizes of our cores. Can you tell us of anything that will attack this coating without attacking the aluminum? Our cores consist of sand and core oil.

A.—The best method we know of for cleaning aluminum coreboxes or dryers is to sand blast them. Ten minutes will clean 200 coreboxes and to clean them with gasoline or coal oil takes soaking for sixty minutes and is quite a job to clean at that. The core boxes can be cleaned in the sand blast room without damage, very satisfactorily, at little cost. We have seen quite a lot of experiments on this proposition and have found the sand blast the best. W. J. REARDON.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 7

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

Of castings gated at the heavy end, the author, in the capacity of inspector, once scrapped two hundred from the defect as shown. The same gate, transferred to the light end produced castings that went through satisfactorily. The difference will appear in the following analysis of the gate pin hole or drawn cavity, a trouble old as the founding industry itself and as persistent. A gate pin hole or drawn cavity is a direct consequence of gate metal at, and back of its attaching point to the casting, freezing at a time when the casting metal at that point and inward is in its semi-fluid or plastic state. If the gate freezes solid while the casting metal is yet fluid, the gate will take its quota of liquid metal and the loss in the mold will be adjusted at the overall expense of the casting, but with no drawn cavity. If the gate freezes slightly before the casting, then semi-fluid and plastic metal will be drawn out of the casting, cavities resulting.

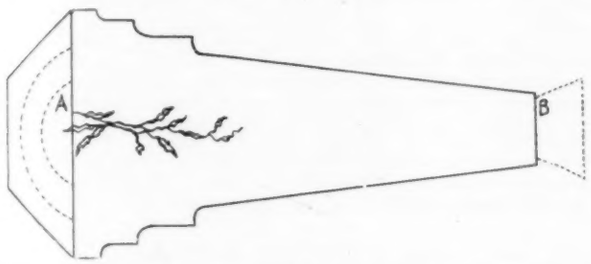


FIG. 22—THE GATE PINHOLE AND INNER CAVITY. ITS CAUSE AND REMEDY. If a broad thin gate attacks at points either A or B, the gate will solidify while the casting metal is still fluid. This fluid casting metal will simply close up, at the casting's overall expense, any loss of metal the freezing gate takes from the mold. If a medium-sized gate is placed at point A, this gate will solidify when the heavy bulk of casting metal is in its semi-fluid or plastic state and pull this plastic metal out of the casting, leaving the gate pinhole and inner cavity. If this same gate be placed at point B it may remain fluid until after the casting has set and feed rather than rob the casting at that point as the casting freezes. If a large gate (dotted line) with ample height and bulk back of it be placed at point A that gate will remain fluid or semi-fluid until the casting has frozen solid, thereby feeding all centres of final concretion in the casting and eliminating all possibility of draw or cavity. The principal against the pin hole or drawn cavity therefore is, freeze the gate either well before or well after the casting sets. To guarantee the the cavity against all possible shrinkage in all centres of mass or of final concretion, the heavy gate at point A is the best method. A medium gate at point A produced 200 castings with cavities as per sketch. The same gate transferred to point B yielded satisfactory castings although microscopic examination would no doubt disclose shrinkage more or less prominent in the centres of mass and concretion of the bulky end of the casting. That the shrinkage effect did not materialize sufficiently to expose it to naked vision is due to the difference in temperature of the metal at the two ends at the finish of pouring. The metal at the heavy end was then colder than at the lighter end, and in part at least, adjusted the difference in bulk with respect to concretion.

If the two freeze simultaneously the casting will be likely to suffer. If the gate freezes well after the casting has solidified, all depletion will be met by a replenishing supply from the gate without cavity or overall adjustment in the casting. The fundamental principle against the gate pin hole or drawn cavity is therefore reduced to the simple practice of freezing the gate either well before or well after the casting has solidified.

Almost every gate attached to a casting functions either to the running of the casting or the feeding of the casting or both. When the mere delivery of metal to a mold is the only consideration, attaching gates should be cut thin and broad to serve the dual purpose of delivering a cleaner metal and of solidifying while the casting metal is yet liquid thus obviating a draw. But a gate of this design can never be depended upon to deliver the full-sized, unshrunken casting throughout that a heavier gate will yield. To get a perfectly solid casting throughout, gate metal must exceed casting metal in bulk and longevity of fluidity so as to keep in open touch with centres of mass, and must by high sprue pressure be fairly driven into those vacancies created by the line of congealing metal moving from casting surfaces toward these centres of mass.

Now all castings cannot be so gated and the question naturally arises, "What happens in these cases and why do pin holes or cavities never show up?" The answer is that the smaller gate remains open and feeds the solid crust formation around its attaching point beyond the depths of machine finishing, leaving the final disturbance uncovered in the vitals of the casting, but surely there. In and around their centres of final concretion very few if indeed any castings are perfectly compact and solid.

An example directly from experience will illustrate. Fig. 23 shows a brass terminal casting of varying form and bulk, cast solid and machine drilled at points A and B. The hole at point B had always been a 1½ inch diameter opening drilled through the casting. The hole at point A had always been a one inch hole drilled to point C a depth of 1½ inches. The casting was then heated, hole A filled with solder and a copper wire inserted and left to cool to form the connection between the wire and the terminal casting. One hundred of these castings were ordered for a special job where hole at point A was drilled to two inches depth instead of 1½ inches and hole B was increased from 1½ to two inches diameter. The castings were made from the same gate as always. When filled with solder in hole A the solder dripped down through a cleavage line into and out of hole B. This happened in every casting and all had to be scrapped and made over using a new and entirely different type of gate. The larger drilling had simply gone far enough to reach the inner weakness of the casting. Incidentally the casting affords a good study of variation in bulk, centre of mass, ratio of volume to surface, concretion, etc.

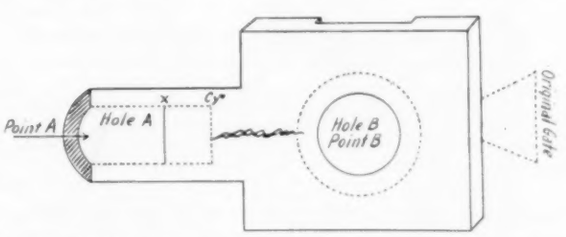


FIG. 23—CROSS SECTION OF A TERMINAL CASTING. At and around their centres of final concretion few if any castings are perfectly free of shrinkage effects. Holes A and B are drilled holes, hole A originally extening to point X, hole being located within the solid line circumference. Casting was heated and hole A filled with solder into which copper cable was inserted and left to cool. On original drilling of holes no trouble showed up. For a special purpose one hundred castings were required with hole A extending to point Y and hole B enlarged to dotted line circumference. On filling hole A to Y with solder, the solder started dripping through to and out of enlarged hole B. Examination disclosed the shrink line as sketched between the two holes. It had always been there but the machine tool had never gone far enough to reach it. Variation in surface to volume ratio caused it. It was overcome by placing a heavy gate at point A.

The round section has the greater bulk as well as the

* All rights reserved. This series will be collected and published in book form. Parts 1, 2, 3, 4, 5 and 6 were published in our issues of July, August, September, October and November, 1926, and January, 1927.

greater ratio of volume to surface. The flat section therefore, cools first and draws on the semi-fluid centre of mass in the heavier section, winding up with the shrinkage line as indicated. To overcome the difficulty a heavy gate was placed at the end of the heavy section.

In molding castings vertically it very often happens that the drawn cavity will occur above the centre of concretion while those molded horizontally frequently show it toward the gate side of the centre of mass. Both are perfectly natural. Under a vertical riser of inadequate bulk or feed, the riser, in freezing, draws to that depth of casting metal reached when the riser is frozen solid and done drawing. Plastic metal at that depth simply settles down and feeds the center of concretion. If there be no riser, this settling process proceeds under a cope crust of metal that solidifies while the casting metal downward is yet fluid. As this downward mass congeals it simply breaks away from the crust leaving the cavity. In the case of the horizontal, the back end of the casting and the center of mass, freezes first because it is farther from the gate and consequently at a lower temperature. This, of course, subjects the gate end of the casting to the freezing pull of both the gate and the "center-to-back" section of the casting.

Shrinking and low cohesion are fundamental to heavy

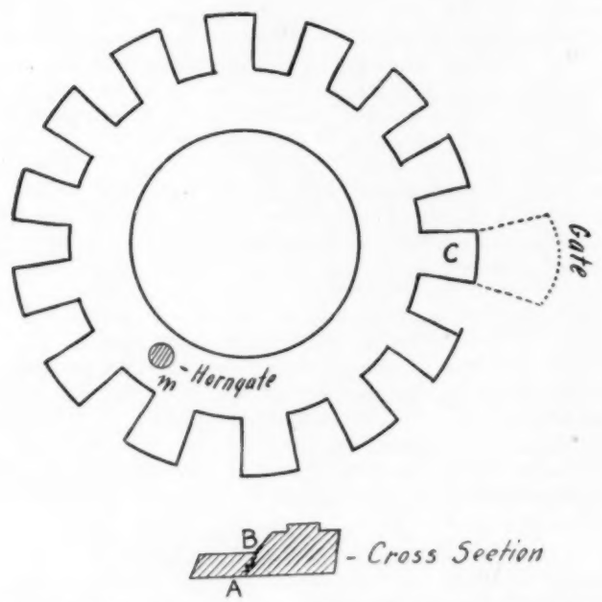


FIG. 24—SPACING RING GATED ON FINGER "C" DEVELOPED SHRINK CRACK along line AB (Cross section) at union of fingers with ring body. Horn gate attached to ring body at point M eliminated the difficulty.

cleavage and the finer forms of cleavage, known as the "hair line fracture." These conditions are very prevalent and should be considered even the more seriously because the rough casting very often suggests no indication of the inner weakness. Fig. 24 shows a brass spacing ring of which 30 were made and shipped as apparently solid castings. They were gated on one of the fingers with a heavy gate. In machining, this gated finger developed a shrink crack at its union with the ring body and from 10 of the rings this finger dropped off in the lathe. Analysis will at once make the thing clear. The finger itself was forced to function as a gate to the heavier body of the ring to which function it was not adapted. Lying between and subject to the opposite pull or two heavier bodies of metal, it had to give at the weakest plastic point which happened to be at the junction with the body. A horn gate attached to this ring body exempted succeeding castings from the defect. The annular crack in hollow cylinders molded on end and the cleavage planes in flat plates (Fig. 25) can be traced also to shrinkage and impaired cohesion. The two are practically identical in nature and cause. They show two planes of congealing metal moving toward a common center from two opposite and unequal radiating sur-

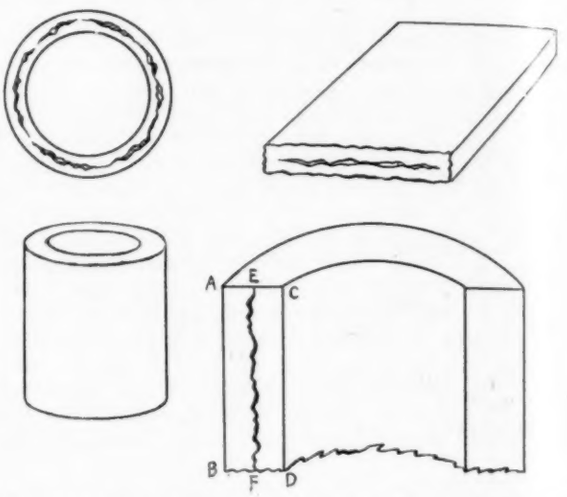


FIG. 25—CONGEALING PLANES OF METAL APPROACHING EACH OTHER from surfaces AB and CD meet along the plane EF and either consume this final congealing film or bear apart from it leaving the rupture plane. Annular cracks usually locate closer to the inside than the outside surface of the cylinder. By virture of greater surface on the outside the rate of congealing is faster inward than outward. When green sand cores are used the outside surface is or ought to be also harder than the inside, thus additionally hastening the "outside-inward" congealing rate. The plate cleavage plane can be annalyzed similarly.

faces and pulling in opposite directions at the plastic metal along the plane of their meeting. This plastic mass may represent inferior metal or metal impaired by oxides carried to this meeting plane, but whatever the attending factors, shrinkage and low cohesion are fundamentally responsible for the split. Both are perfectly natural phenomena that show how two congealing planes approaching each other from opposite directions can never meet because they either consume the final plastic film that might connect them or break down its cohesion by their opposite pulls on it.

In the non-ferrous field the condition is especially common to the high zinc copper alloys. Changing physical properties is sometimes the only remedy, i.e., reducing the zinc and adding small percentages of lead, although the author has many times escaped the difficulty

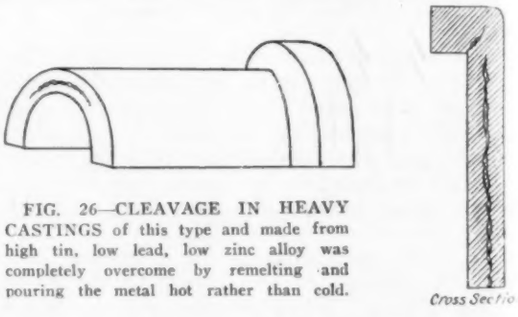


FIG. 26—CLEAVAGE IN HEAVY CASTINGS of this type and made from high tin, low lead, low zinc alloy was completely overcome by remelting and pouring the metal hot rather than cold.

by simply re-melting the metal. He has done this particularly in the high tin, low lead, low zinc, copper alloys where the tendency to cleavage is also comparatively active (Fig. 26).

This series will be continued in an early issue.—Ed.

What is Wrong with the Foundry Business?

An Address to the New England Foundrymen's Association, November 10, 1926

By HARRY D. NEACH

Director of the Market Analysis and Development of New Products Division, The Sherman Corporation, Engineers, Boston, Mass.

The survey which I will discuss covered the foundry industry, not only in New England, but also in Pennsylvania, New Jersey, Ohio, Missouri, New York, Michigan, and Illinois.

The problems which confront the foundry industry of our country today are overcapacitation of plant, and an increasing loss of business, the destroying of potential business, the narrowing of profit margins, and diminishing dividends.

In the preparation of the survey and analysis I first sought the aid of the trade publications. Right here I would like to express my appreciation for the cooperation of the publishers of The Foundrymen, The Iron Trade Review, Iron Age, and THE METAL INDUSTRY.

Our next move was a personal survey of the field in the states and sections which I have mentioned. This survey included operations of job plants, and what I will term "auxiliary plants." By auxiliary plants, I mean foundries which are only a part of some manufacturing equipment. The problem of the job plant class is, as I have stated, overcapacity; that is, more plant than necessary for the volume of business that is being carried on, narrowing down of profit margins, and a general falling off of profitable business. In the auxiliary-plants we found conditions somewhat similar, thought not so serious.

UNFAIR COMPETITION

In these shops we found in a great many cases that the foundry did not have enough to keep it busy, so as a means of helping to reduce the overhead and keep the plant constantly in operation, business was being sought from outside sources; that is, these plants were doing job work which should have been done in job plants. Work was being solicited from outside sources in competition with job plants, and in a large majority of cases where this competition was at all keen on a particular job, we learned that the auxiliary plant was usually able to confiscate the business.

We were, of course, familiar with this condition, but we did not believe that it had gotten to the proportion our investigations plainly showed, and right here we found one of the principal reasons for the practical collapse of the foundry industry.

A careful analysis of the costs of producing castings in these auxiliary plants proved without question or doubt that many jobs were being taken, not only with ridicuously small profits, but many times at a definite loss.

In the job shops we found that in order to compete for this business, foundrymen were of necessity forced to take work at a very small profit, and also in a great many cases, under cost.

NO COST SYSTEMS

Another alarming discovery was made when we got into the analysis of the cost of producing castings. In both shops we found that there was no definite or consistent method of attaining costs.

POOR MERCHANDIZING METHODS

Your second problem is the problem of merchandizing. In the first place, the foundrymen as a whole have never made a study of merchandizing. They do not know how to merchandize successfully the product they are manufacturing. To a man in my position looking at your industry from the outside, the merchandizing of castings would seem to be a simple matter, and one that is not difficult to master. You ought to know, I say, what your costs are; and knowing that, you should not take a job unless there is sufficient margin to net a profit; but unfortunately for the manufacturers, there are other considerations which must be met. To be profitable a plant must operate; it cannot lie idle, and to operate it must necessarily have orders. Merely to close the door of the plant because of lack of work does not stop losses by any means, and as volume of output decreases so the unit cost increases, so that the problem of the foundrymen is more and more difficult to keep costs below selling price.

Again, each plan has an organization, a force of fellow-beings whose livelihood and existence depends on the operation of the plant. No manufacturer will, until he is forced to do so as a last resort, disregard the welfare of these men by allowing his plant to close. Also each plant has a certain number of customers to whom it is bound to produce by contract or mutual understanding, castings at regular stated periods. To close down in dull periods and tie up their customers, or to lose an organization of able men which it has taken years to build, means a loss which cannot be made up once it is sustained, save by years of the hardest kind of effort.

It is quite easy to state that castings should be merchandized on the basis of cost, plus a fair profit, but it is another thing to enforce it. Your ability to put this principle into operation is the factor that determines failure or success, and so far as I have been able to learn through many methods of analysis, there is no set formula for success.

But cost estimating in a foundry is not a science, it is the culmination of everyday common sense and a knowledge of conditions in the industry. Do not understand that in this statement I mean to suggest the elimination of cost estimates, for this is farthest from my thoughts, and I know that in a great many foundries cost experts have been employed for the sake of establishing, as far as possible, schedules. But this is not sufficient, because of the various changing conditions that confront the foundry owners almost daily. What you need is not a schedule of costs, but the ability to constantly analyze your expenses so that you may get sufficient price for your product to warrant a fair profit.

Perhaps the answer to the proper merchandizing of castings lies in the closer cooperation of you foundrymen through the means of your organization. Please understand that I am not advocating the violation of the Sherman Law. But I am advocating a serious and careful study of the conditions and the problems that confront your industry today through your organization. And, having summarized those problems and conditions, take immediate steps to rectify them and improve them.

THE JOBBING FOUNDRY'S PROBLEM

I have another thought that I want to leave with you

tonight, which bears a close connection both with the problems of merchandizing your products, and the over-capacitation of your plants.

This suggestion will apply more particularly to the owners of job plants. Your big problem today is to get sufficient business at a profit to keep your plants running. I want to advise you that this problem is very sure to increase rather than lessen.

More and more each day we hear and read of manufacturing plants which, believing they can save money in their operation costs, establish their own foundries. This may or may not be so, but the fact remains that auxiliary foundries are constantly being established, and the reason for it is that manufacturers are confidently of the belief that foundrymen have been charging them exorbitant prices for castings. Personally, I know this is not so. Our investigations prove that foundrymen have never, at least since the days of the war, had a substantial profit, and I also know that manufacturers are making great mistakes in putting in their own foundries, especially where the work for such foundries is not sufficient to keep their foundry operating to capacity.

DEVELOP SPECIALTIES

The suggestion I would make to you tonight is that you give consideration to the securing of the right kind and type of product which you can manufacture and sell as your own. In other words, I would suggest that you develop some product which has a substantial market, and which you can manufacture and handle through your own selling forces. Such a proposition carries with it many advantages. In the first place, it will establish for you a business of your own which competition to any large extent cannot destroy. Second, it allows you to control the product through its manufacture and sale, which having been built to successful standards will offer you a means to uninterrupted progress and growing profits. This means that the foundrymen should come to realize that this is, perhaps, one of the soundest ways for them to overcome their problems of production. It also means that you must apply your wisdom to the study of merchandizing. It will mean in a great many instances, the establishment and the maintenance of selling organizations. It will mean familiarity with advertising campaigns, and the most successful methods of distribution:

In following this line of suggestion, the first and most important duty of the foundrymen is to analyze and establish his production costs. Of course, most of you will say "I know my costs." That is what they all say, but we have found in the careful analysis of their shop practices that their costs are exceedingly high.

A careful analysis of one company's total manufacturing cost for the last three years shows that the metal which went into their furnaces comprised but 18.8 per cent of the total cost, that labor including management consumed 49.9 per cent of the cost, and that materials other than metal plus general manufacturing expense accounted for 31.3 per cent of the cost. In other words, during the whole of the three-year period metal accounted for less than one-fifth of their total cost of making castings.

These figures will vary somewhat, of course, for other foundries. Nevertheless, it holds for all foundries, that instead of selling pounds of metal primarily, foundrymen must realize that their costs include hours of labor, the quality of that labor, miscellaneous materials, cost of production and overhead.

Brass Billets for Extrusion

Q.—We are interested in the manufacture of brass billets for extrusion purposes, and should be glad to know if it is the practice in America to cast these in long lengths and then saw them up into suitable sizes?

A.—The practice used in extruding rods varies to meet the needs of the different manufactures. The general practice is to use large billets from 150 to 350 lbs. in weight; only the gate or "shrink" is cut off. In some cases the shrink is left on, the shrink end being placed against the plunger.

In extruding small sizes, the die carries a number of small holes through which the metal is extruded. The same sized billet is used as in making the large diameter rods and shapes. The castings run up to 48 in. in length, depending upon the diameter and weight desired.—W. J. PETTIS.

Reclaiming Chips

Q.—We would greatly appreciate any information you may have on reclaiming brass and bronze chips. At present we have been melting same in crucibles, but find melting loss high and oxidation very bad in castings poured. We have found that in melting over and pouring into pigs we get good castings.

A.—We suggest you use a deoxidizer in melting your chips. A handful of salt will greatly aid you in overcoming your trouble, due to oxidation. A better way to use your bronze chips would be to use about 20% to each pot. However, if your metal consists principally of chips, we suggest to look through the advertisements in the METAL INDUSTRY and get in touch with some of the makers of fluxes to overcome such difficulties in melting. In the meantime a handful of common salt added to your metal will help. Also to overcome your loss look after the manner of charging the metal in the crucible. Get a well of metal in your crucible and keep adding and pushing the metal down from time to time. Also be careful of the amount that is lost in the pit in charging, by falling outside of the crucible.—W. J. REARDON.

Smelting Lead

Q.—We want a furnace to be used in the smelting of lead salts and to obtain two tons per 24 hours of finished lead metal. What would you recommend?

A.—The best furnace we know of for the work is the blast furnace or a reducing furnace similar to the open hearth furnace used in the steel works.

However, as there seems to be a desire for a small furnace to do such work from time to time, we are of the opinion it could be accomplished in the open flame oil furnace. We have in mind a furnace, if you can take care of the lining, that will be barrel shaped and will rotate all the way around. As the lead is reduced to metal the furnace can be tilted so the lead will run out into a receiving pot. After the slag is run out in ladle buggies, use a flux of:

Soda Ash	15 lbs.
Silica Sand	75 lbs.
Fluorspar	50 lbs.
Coal Dust	200 lbs.
Lime	50 lbs.
Iron Scale	100 lbs.

Mix with 100 parts of lead salts or battery dross, 20 parts of the above mixture and charge the furnace. It should reduce the dross to metal. However, the best furnace for the job is the blast furnace.—W. J. REARDON.

Metal Spinning

A Practical, Working Description of the Operations Involved in Spinning Metal Trays and Cups, as Practiced in England

Written for The Metal Industry by WILLIAM MASON, Metal Spinner

A small tray, such as is used for whist-markers, can be made either wholly of metal or with a wooden bottom. Fig. 3 shows the first, half in elevation, half in section. It must be held on the chuck by a bung as shown, and should be annealed once. To bring the metal home in the sharp corner A, Fig. 1, use a tool in the manner shown. When the metal is turned true, grip the edge with the nose of the pliers, well oiled; while the metal slips round, move the pliers steadily through a quarter of a circle, when the edge assumes the shape in Fig. 2. To finish the bead, use the tool shown by Fig. 7 in a previous article,* on the plane of Fig. 9, in the same article finishing round, not flat. For finishing inside, turn a recess in a piece of wood after the manner of Fig. 10, in last article, then turn and polish.

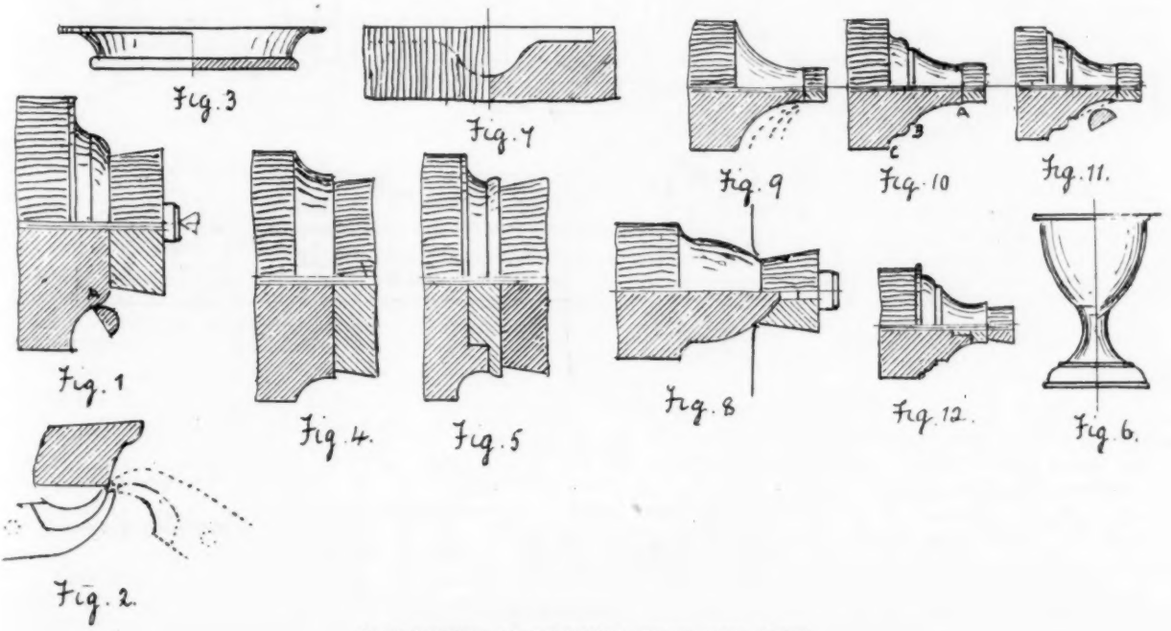
For a tray with a wooden bottom, choose mahogany or walnut 3/16 in. thick and either French polished on both sides, or with one side covered with green baize. Fig. 3 shows the tray in elevation and section. First spin the metal as in Fig. 4. For narrowing, Fig. 5, the chuck is made in two parts which fit together, and by spinning the metal home to the surface of the chuck the front piece of the chuck is encased in the metal. The diamond-pointed tool applied at the edge turns off a round blank which, when unscrewing, will come off, together with the front part of the chuck. The head is formed before removing the bottom blank, as in the previous case. To fit the wooden bottom, put the polished wood between a chuck turned flat and covered with wash leather, and a bung treated similarly; bring up the tailstock, and the wood can be turned with a sharp turner's chuck. Place the metal ring on the chuck as in Fig. 5, with the front part removed; put the wood in place and the bung with wash leather to it, bring up the tailstock, and the metal can be fitted tightly over the wood. Of course, if the tray is to be plated, that must be done before mounting the wood. Polished copper might be left bright, provided the metal is painted with a transparent celluloid varnish.

The egg cup, Fig. 6, is essentially a miniature goblet made of two parts, the bowl and the foot. A stand for three, four, or more can also be spun. The bowl being rather deep is not spun up directly on the chuck. A flattish piece of beech, Fig. 7, is fitted on the lathe, and a recess is turned in it about ⅛ inch deep, and just large enough to hold the blank. Now in the chuck turn a hollow with rounded edges of about one-third the depth of the bowl of the egg-cup and rather larger. Put the tee-rest in position, press the blank on the recess, and, while the lathe is running rapidly, place the knob of the tool shown in Fig. 6 of previous article, in the center of the blank; give a light press and move the knob upwards till the wood of the chuck is felt. Return with the toll to the center and continue thus till the wood of the chuck is felt all over; then release the blank.

Next make a chuck for finishing the bowl. Select a piece of sound, well-seasoned hornbeam, fix it and turn it to shape to a template of thin zinc. Fig. 8 shows the chuck carrying the blank and also a bung, turned hollow where it presses against the blank and fitted with the steel center used with the dead center. Before screwing up the dead center, set the lathe going, and if the blank runs "drunken," true it by holding a tool or piece of wood against its face and pressing gently. Screw up the center, lubricate the blank, and spin as previously described. When the metal goes hard, release, anneal, pickle and finish spinning.

The edge is rounded into a bead and the bowl finished by turning and polishing. The outside can be finished on

*THE METAL INDUSTRY, May, 1926, page 185.



OPERATIONS IN SPINNING TRAY AND CUPS

the chuck used for spinning the bowl; for the inside, chuck a piece of beechwood and turn a hollow to hold half the bowl tightly. Before putting aside, turn a small circle at the bottom of the bowl, which will help materially when the foot is soldered on.

As the foot of the egg-cup is small, use the small chuck—holder (Fig. 1, previous article*) either with boxwood or brass for the finishing chuck. Figs. 9 and 10 show stages of the process, and as the metal will require perhaps two softenings it is well not to turn the chuck to its proper profile till after the last annealing. The foot is narrowed into a neck, which can be formed in either of two ways. After the last annealing turn the chuck with the profile A, B, C, Fig. 10, and spin home the metal between B and C that is to form the staffs and bend, but leave the part between A and B untouched. Next turn the chuck to the profile in Fig. 11 and put the metal on again, the bottom part now fits as before, but an annular space is left between the chuck and the wood. Now apply the round face of the tool, shown in Fig. 9 of previous article,* underneath the work. Start from B, Fig. 10, and move towards A, taking small feeds each time; on part of the chuck the metal will be pressed home. Turn out the small bottom and thin to a knife-edge a neat joint with the bowl; then turn and polish it. To solder the foot to the bowl, tie the two together with wire, the circle turned on the bottom of the bowl guiding; drop a little soldering liquid inside and a pellet of soft solder, and apply the blowpipe till it flows. Any solder sweating out is easily removed by placing the egg-cup on the bowl chuck, steadying by a bung and tailstick, and applying an outside turning tool, emery, etc.

For the second method consult Fig. 12. The loose front part of the chuck should be of brass, it joints the fixed part at the narrowest point. When the small bottom has been turned out the loose part of the chuck remains ready for another foot.

For all of the above-named articles use metal of a thickness of No. 25 or 26 gauge except for the bowl of the egg-cup, which ought to be one number thicker.

*See THE METAL INDUSTRY, May, 1926, page 185.

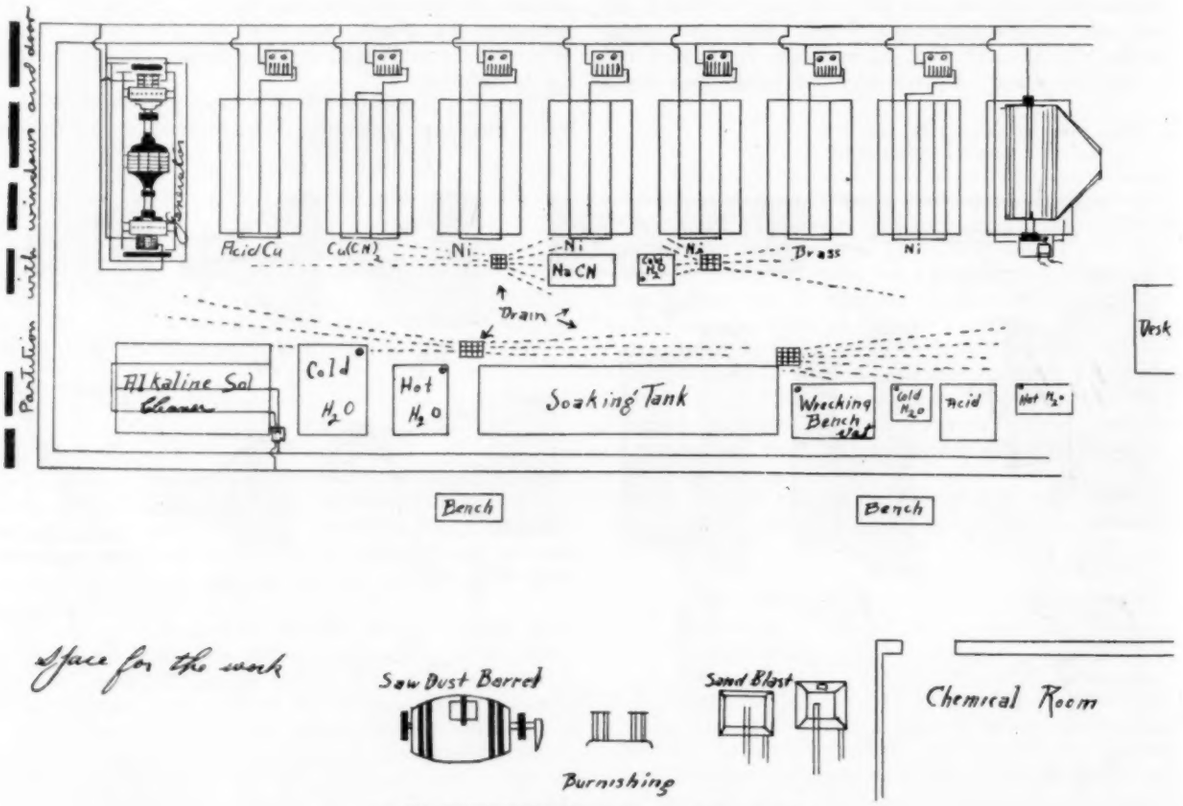
An Efficient Plating Room Layout

Below is a drawing of a plating room which, no matter how large or small, can be worked with great success for production and quality of output.

Each tank has its alley way; also the floor has a draining ditch which will allow the dripping to go into the drain holes. Many steps are saved by the arrangement.

The tank operator is not obliged to go back and forth for the want of a wash water, nor does he have to zig-zag nor does he have to dance the Charleston across the room and around the room to enter from the soaking tank to the cleaner. One or more cleaners can be placed in the plating room. The cleaner tank has a double throw switch to use for plating or stripping. All tanks including cleaner, should have some kind of agitator.

Space is allowed for the sand blasting, burnishing barrel and sawdust barrel and also ample room for stock. In the corner, at a very small expense, a partition can be built. This will allow a chemical supply room. There is a partition at the other end of the plating room showing door and windows. This will allow the foreman from his desk to see not only the plating room, but also the polishing room.—A. V. RE.



AN EFFICIENT PLATING ROOM LAYOUT

Metal on Plaster and Wood

The Art of Metallizing Non-Metallic Surfaces

Written for The Metal Industry by CHARLES H. PROCTOR, Plating Chemical Editor

Q.—I have a problem in wood and plaster plating and would appreciate very much if you could give me a good metallizer to apply; one that has good adhering qualities, to be plated in a duplex copper solution and have a good thick coat of copper; also the best method of applying the same. It must be cheap.

Also please give me a good copper solution formula for plating the metallized wood.

A.—The art of metallizing non-metallic surfaces such as plaster of paris, wood, etc., depends upon standard methods of preparation of the surface of the articles to be coated with metal, as well as standard methods of control of the plating solution, including current control, etc.

For plaster the manipulations should be as follows:

1st. The articles made from plaster must be carefully dried at temperatures from 140 to 200° to eliminate moisture from the plaster.

2nd. To fill up the pin holes, etc., on the plaster so that the acid copper solution will not be occluded and afterward the solution spot out, the thoroughly dry plaster articles must be immersed in a molten wax solution consisting of—

White Paraffine Wax	2 pounds
Brazilian Carnauba Wax	1 pound

Prepare sufficient wax mixture so that the articles to be treated can be entirely immersed in the wax.

Temperature of wax should be 220 to 240° F.; time of immersion, 5 to 10 minutes or until air and moisture is entirely expelled from the plaster. When bubbles no longer appear on the plaster the operation is complete.

Drain the articles thoroughly and allow them to become hard and dry.

3rd. Following the wax operation the plaster articles should be coated with two thin coats of yellow shellac dissolved in denatured or wood alcohol, either by brush or spray, then let the articles dry hard.

4th. Prepare a bronze lacquer from copper bronze medium collodion lacquer and platers' or electrotypers' copper bronze powder. The average mixture is one pound of bronze powder to one gallon of lacquer medium.

If necessary the mixture should be thinned down with lacquer thinner so that it will spray uniformly. It is better to apply two thin coats of bronze powder than one thick coat.

Furthermore, the two coatings will produce a more uniform surface which is very desirable. The articles so treated should now stand for several hours in a room free from dust, and will then be ready for copper plating when dry and hard. Soft copper wire should now be used to wire up the articles to give the necessary negative contact. Use several wires so that the maximum of conducting will result.

5th. The copper sulphate solution should be prepared at least one day before operation. Either of the following formulae may be used and will prove effective:

Water	1 gallon
Copper Sulphate	28 ounces
Sulphuric Acid	4 ounces
Yellow Dextrine	½ ounce
Water	1 gallon
Copper Sulphate	24 ounces
Sulphuric Acid	6 ounces
Oxalic Acid	⅛ ounce

All insoluble materials should be removed from the solution by filtering through several thicknesses of cheesecloth attached to a wooden frame to allow considerable volume to pass through.

6th. The solution after filtering and cooling down to normal temperature, 80° F., will now be ready.

Anodes should be of soft sheet copper not less than ⅛ in. thick; surface area at least twice that of the articles to be copper plated. The solution should be preferably agitated with compressed air passing through lead pipes suitably perforated and arranged at the bottom of the tank. Just sufficient air pressure should be used to keep the solution in a mildly agitated state.

Voltage, 1 to 2—amperage, 10 to 20 amperes per square foot of surface, or as may be found satisfactory. Avoid an excess of current. Time of deposition is from 12 to 24 hours, depending upon thickness of deposit required.

7th. After copper plating the articles should be thoroughly washed in cold water and only medium hot water, then in sawdust. Boiling water should not be used because of the unequal expansion under heat of copper and plaster.

8th. After copper plating and drying, the articles can then be acid dipped to bring up a lustre finish in the backgrounds or detail work, then buffed to a finish and finally plated in any finish desired.

9th. Hard wood such as maple or walnut, fabricated into mouldings, etc., if kiln dried so that all moisture is eliminated from the wood, may be directly copper plated after applying the copper bronze powder, as previously outlined. The application of wax or shellac will be found unnecessary. Wooden articles will have to be weighted down with lead or stone to keep the articles beneath the solution. Any similar method may be used.

Cord immersed in molten paraffine wax will be advantageous in supporting the weights applied to the wood. The wax makes the cord waterproof and solution-proof.

Statuary Bronze Finish

Q.—Will you please tell me, step by step, how to do statuary-bronze on brass and bronze push-buttons. We have had quite a little trouble about this finish.

A.—It is not a difficult problem to produce a uniform statuary bronze finish under the correct methods of manufacture which should be as follows:

1. Cleanse your brass and bronze after polishing the surface to a cut down finish, with tripoli.
2. Copper plate in a warm copper cyanide solution for 5 minutes so that a clear uniform copper deposit results.
3. After copper plating wash the articles thoroughly in water.
4. Then immerse in an oxidizing solution of water 1 gallon; polysulphide ¼ oz. The solution should be used cold.

Immerse the articles for a moment or two, lifting them out of the solution every few seconds until they assume all the colors of the rainbow. Then remove them quickly, wash in cold and boiling waters and dry out in maple wood sawdust. Bring out the statuary bronze color by brushing the articles dry with 4 inch three rows crimped wire steel scratch brushes. Finally lacquer by spraying or dipping. Then dry as usual.

The amount of polysulphide used per gallon of water is an important factor so do not exceed the proportions given unless it is found necessary.—C. H. Proctor.

Buffing Compositions

Composition and Qualities of Buffing Compositions. From the Monthly Review

By F. R. PORTER

Edison Electric Appliance Company

Buffing compositions, as we understand them today, are compounds prepared to be used in giving a final finish to metal surfaces, the purpose of which is to produce a high lustre and an attractive appearance. This paper is the result of an investigation of these compositions with the idea in view of establishing a specification, or specifications which, when adhered to, would result in the purchasing of compositions suitable for use by the Edison Electric Appliance Company for finishing plated parts.

The final finishing or buffing of metal parts, particularly plated parts, has become a very important industry. Many articles and appliances are sold mainly on their "looks" or appearance, the mechanical soundness of them receiving but little thought by the purchaser. The higher the lustre and the more pleasing the appearance, the more readily the article may be sold.

Obtaining a high lustre and a pleasing finish on metal parts requires a careful selection of finishing or buffing materials, proper equipment and experienced operators. Careful selection of materials requires that standards be established; yet in industry today there are few, if any, standards covering such materials. Indeed, there is little published data or information on the subject.

In general, buffing compositions consist of a mineral powder of suitable mesh, termed the abrasive, held together by means of animal, vegetable and mineral greases, termed the bond or binder. They are made by stirring the powder into the melted binder, pouring into suitable containers, and sealing.

REQUIREMENTS

A satisfactory finishing or buffing composition must first of all give the required color and lustre to the article; it must work fairly rapidly; it must not gum up the wheel or smut the work; it should be readily removable—saponifiable, or emulsifiable, or both—in a suitable cleaner; it must be efficient, that is, produce the greatest number of satisfactorily finished parts per dollar spent.

COLOR AND LUSTRE

In the buffing or finishing operation color and lustre are imparted to metals by that part of the buffing composition called "the abrasive." Abrasive is hardly a correct term, as the action of this part of the satisfactory composition should be one of burnishing or smoothing, rather than abrading or scraping off. Any abrasion or cutting down should have been done on the part before plating.

The universally accepted abrasive for finishing compositions is dolomitic lime, containing usually above 30 per cent magnesia, although lime lower in magnesia may be used. High calcium limes are not used because they slack too quickly, and because they absorb more grease or binder than the magnesia lime, thus making a more expensive composition. Dolomitic limes slack about one-half as fast as high calcium limes and expand in slacking far less—expanding perhaps one and three-quarters to two times compared to two and one-half to three and one-half for the high calcium limes.

Other "abrasives" such as emery flour, tripoli, pumice, amorphous silica, crocus and rouge may be and sometimes are used in finishing compositions mixed with the lime. Their use is questionable as they are either too sharp and hard grained, cutting the metal away rather than smoothing and burnishing it, or they are more expensive than lime.

Tests have shown that a straight lime composition properly compounded gives a high lustre and as good a color and works as fast as a composition containing 8 to 10 per cent silica, for example. A lime composition also does not, in general, cut away at much metal as a silica composition because the grains are round and soft, which tend to crush down during buffing.

WORKING QUALITIES

Finishing compositions are divided into three classes, depending upon the amount of grease or binder present, viz., greasy, medium and dry. The working qualities of a composition depend very largely on the percentage and quality of the grease or binder in it.

A greasy composition when applied to a buff wheel deposits more composition than a medium or dry one containing the same grease base. Also more composition remains on the wheel from the greasy composition due to the larger percentage of grease. In general, heavy work, nickel-plated steel, for example, will require a greasy composition containing 26 per cent to 28 per cent grease or binder. Medium work will require a medium composition containing from 23 per cent to 25 per cent grease, while light work such as nickel-plated brass or copper will require a dry one containing from 20 to 22 per cent grease.

Experiments have shown that it is highly important to use compositions containing the proper amount of grease. For example, one experiment conducted showed that with a composition containing 29.4 per cent saponifiable grease and 70.6 per cent dolomitic lime, 100 nickel-plated parts were finished in 89 minutes and that 6⅔ oz. of a standard 14-in. buff were used up in the operation; while the same weight of a composition made up with the same lime and grease, but in the proportions of 23 per cent grease and 77 per cent lime, 100 parts were finished in 105 minutes, using up 9¼ oz. of the buff in the operation.

The quality of the grease used also has a large bearing on the working qualities of a composition. A case in point was two dry compositions used on finishing nickel-plated brass parts. Both contained approximately 24 per cent grease and 76 per cent lime. One was fairly soft and worked quickly. The other was very hard, and worked noticeably slower because of the difficulty of getting enough to stick to the buffing wheel.

The quality of grease controls largely the consistency of the composition. This is readily realized when we remember that, for example, the hard and soft tallows commonly used have approximately the same melting points—116° and 118° F., respectively, but are vastly different in consistency, the hard being much firmer than the soft tallow. Two compositions made using these greases in the same proportions would be just as different in consistency.

Tests made in sample of two dry limes from different manufacturers showed that each contained approximately 23 per cent grease and 77 per cent dolomitic lime, but one

solidified at 65.0° C. (149.0° F.), the other at 52.0°C. (125.6° F.). The one solidifying at 52.0° C. showed the better working qualities upon test. There is, of course, a limit to which the melting point can be carried. Experiments and tests indicate that the best compositions are those solidifying around 50° to 55° C.

SMUTTING

Smutting the work generally is an indication that too much composition is being used—an indication that the composition used is too greasy. In general, lime compositions containing more than 28 per cent grease will show a tendency to smut when used on "heavy" finishing. On nickel-plated copper and brass parts (light work) smutting will tend to occur with compositions containing much over 22 per cent grease.

It is the belief among composition manufacturers that compositions containing unsaponifiable greases will smut quicker and more than those containing only saponifiable ones. This has not been our experience. Compositions containing as much as 10.3 per cent unsaponifiable out of a total of 29.4 per cent total grease have been used with equally as good results in this respect as a similar composition containing only saponifiable greases. In general, it may be said that smutting is due more to the quantity than to the quality of grease or binder in a satisfactory composition. However, it must be remembered that the quality of the grease affects, to some extent, the absorbing capacity of the lime and affects the apparent greasiness of the composition.

CLEANING

For a majority of work finished by buffing it is important that any composition used be readily cleaned from the parts. Three methods are in general use for cleaning buffed parts—hand scrubbing with naphtha, soaking in hot alkaline solutions followed by hand scrubbing, and cleaning in hot alkaline solutions with the aid of an electric current—in other words, an electric cleaner.

If cleaning is to be done by soaking and scrubbing in either naphtha or hot alkaline solutions, then little thought need be given to the character of the grease or binder, as practically all usable greases are fairly readily removable in this manner, since the bond is quite soluble in naphtha.

However, hand scrubbing involves considerable labor which makes this manner of cleaning more or less expensive and hence inefficient. In these days of efficiency, such a cleaning method is not long tolerated and we find attention directed toward the electric cleaner as a means of removing buffing composition as well as other foreign matter or dirt. The cleaning action of an electric cleaner is at least threefold—mechanical, by means of the gas evolved on the work; chemical, by saponification or emulsification of greases; physical, by melting the greases. In a conveyor electric cleaner, where the work to be cleaned is mechanically carried through the cleaner, the work is in the solution for perhaps not longer than one to one and one-half minutes so that removal of greases by saponification or emulsification is practically nil, most being removed by the mechanical action of the gas evolved, and by melting.

Cleaning flat, smooth parts in a conveyor electric cleaner offers little or no difficulties, as generally there is only a slight film of buffing grease present. However, on parts which have perforations cleaning is much more of a problem, as the buffing composition builds up in a hard lump on the inside of the parts around the perforations. These lumps are removed with difficulty unless given a preliminary soaking in a suitable solution to loosen the lumps, or permitting them to stand until the lime in the lumps slacks —absorbs moisture from the air—expands and loosens. The parts then are readily cleaned in the conveyor cleaner. The general practice in the Edison Electric Appliance Company's factory is to store buffed parts for at least fifteen hours to let the lime slack and loosen any lumps, then to pass through a conveyor electric cleaner.

Tests have shown that compounds containing saponifiable greases only slack appreciably quicker than those containing unsaponifiable ones. For example, a composition containing 29.4 per cent saponifiable greases slacked 85 per cent faster than one containing the same amount of grease, 30 per cent of which was unsaponifiable.

For the same greases, the drier the composition—less grease—the faster the slackening. Also compositions containing silica slack slower than straight lime compositions, other things being equal. Therefore, for quick slacking and loosening up of lumps, the composition should be made up of saponifiable greases and straight lime.

SPECIFICATION

Work done at the Edison Electric Appliance Company has shown that for finishing nickel-plated appliance parts the following specifications cover satisfactory compositions:

	GREASY	MEDIUM	DRY
Saponifiable Grease	23.5 to 25.0%	21.0 to 22.5%	18.0 to 19.75%
Unsaponifiable Grease	2.5 to 3.0%	2.0 to 2.5%	2.0 to 2.25%
Silica (SiO_2)	Less than 2.0%	Less than 2.0%	Less than 2.0%
Lime { CaO, MgO }	Not less than 67.0%	Not less than 70.0%	Not less than 73.0%
Iron and Alumina { FeO_3, AlO_3 }	Less than 3.0%	Less than 3.0%	Less than 3.0%
Solidification temperature	50 to 55° C.	50 to 55° C.	50 to 55° C.
Firmness of Abrasive	250 mesh	250 mesh	250 mesh

Grease, silica, lime, iron and alumina are determined by any approved method.

The solidification temperature is determined by heating the composition in a suitable container, preferably a titer test tube, to 70° C., allowing it to cool about 1° C. per minute, and noting the temperature at which it becomes solid.

Metal Finish Tested by Reflected Light

Principles of radio amplification and the fact that the intensity of light reflected from a surface is proportional to the degree of surface finish are made use of in a new instrument for testing the finish of metal parts that has been developed by the inspection department of the Packard Motor Car Company after several years of study and experimentation.

As described by C. S. Stark, chief inspector for the company, in the November issue of the Journal of the Society of Automotive Engineers, light from a microscopic lamp is reflected from the finished surface of an automobile part upon a photoelectric cell, such as is used in phototelegraphy for telegraphic transmission of pictures and which responds instantly to minute variations of intensity of the reflected light. This cell is connected with an amplifying tube and a milliameter, with suitable batteries in the circuit. The amplifying tube is of the type used in radio sets. A very high surface polish without scratches reflects the light strongly, while a lesser degree of polish diffuses and weakens it. According to the strength of the light, the pointer of the milliameter swings above or below a set standard.

With this instrument, which can be built for from $100 to $150, surface cracks so slight that they cannot be detected with a microscope are readily revealed, according to Mr. Stark, who believes that the principle employed will become very useful for many other purposes and in many branches of industry.

Review of the Silver Market for 1926

Abstract from the Booklet Published by HANDY & HARMAN, Silver Refiners, New York

From August, 1921, until September, 1926, the monthly average price of the white metal in New York was never below 62 cents. In fact, the opinion held by some that silver was becoming stabilized in the neighborhood of 65 cents appeared to have considerable justification.

The sharp drop in price during the latter part of 1926 from 65.48 cents in June to 53.67 cents in December was therefore somewhat surprising, and it will be interesting to note the causes responsible for this abrupt fall in quotations, which terminated at 51½ cents in New York and at 24⅛ pence in London, rates not recorded for more than ten years.

The decline will be attributed by many to the recommendations incorporated in the report of the Royal Commission on Indian Currency and Finance, substituting gold for silver as the monetary standard, made public on August 4th, but a careful study of the situation would appear to show that such an opinion is unwarranted. Even assuming these recommendations to be adverse to silver, it seems highly improbable that their effect could have been so far reaching as to cause a depreciation of 15 to 20 per cent in the value of the white metal within three months. Since the Commission plainly set forth its opposition to the adoption of any proposals likely to cause a severe shock to silver, the logical interpretation of the action of the market is that the Commission's report merely aggravated conditions adverse to silver, and that a further search must be made for the underlying causes of the decline.

Silver is so largely a by-product of mines operated primarily for the value of base metals that its production remains relatively constant despite even sharp changes in its price level. This steady supply must find a continuous outlet, and any considerable variation in demand is consequently reflected to a greater extent in the market price than would be the case if production were more flexible. Since China and India in recent years have absorbed more than 65 per cent of the silver produced, we may reasonably assume that the basic factors determining its price will be found in the attitude of these two great Oriental countries towards the precious metal.

Chinese speculators led a movement to sell silver heavily for forward delivery; and the Indian Bazaars followed suit, also establishing large bear positions. The resultant decline in price was gradual at first, but became increasingly pronounced as time progressed; and from the latter part of September until the third week in October, when the low point for the year was reached, utter demoralization was evident.

At present the situation regarding the Report of the Commission is that, although the Government of India and the Secretary of State for India announced that they would adopt the Report as a whole, subject to such minor alterations as may be necessary, no action could be taken until the Delhi Session of the Legislative Assembly in 1927. On December 15th, Sir Basil Blackett stated that the Indian Government had sold no silver so far, and did not intend doing so in the immediate future.

It is therefore apparent that the only effect which the Commission's Report can have had upon the price of silver has been sentimental, and it remains for the future to prove how the actual effects have been anticipated.

PRODUCTION IN 1926

We estimate the world production for 1926 at 241,600,000 ounces, of which the United States supplied 62,000,000 ounces, Canada 21,900,000 ounces and Mexico 93,700,000 ounces.

CONSUMPTION

India's imports amounted to 91,500,000 ounces, a decrease of over 14 per cent from the figures of the two preceding years.

China, on the other hand, has taken a larger quantity than in 1924 or 1925, our estimate for this year being 74,000,000 ounces.

The United States Mint Service purchased in the open market and in deposits approximately 6,680,000 fine ounces all for use in the manufacture of subsidiary silver pieces, and coinage requirements of the Mexican Government amounted to slightly over 4,100,000 ounces.

The consumption of silver in the arts and manufactures in the United States and Canada is estimated at 33,500,000 ounces for 1926, which is about 2,500,000 ounces more than for 1925.

The heaviest increase has been in the chemical and photographic lines, which includes films. The total consumption in this field was about 20 per cent greater than in 1925.

The sterling silverware trade had a very good year and shows an increase of about 3 per cent in ounces of silver consumed. Silver plated ware increased about 4 per cent.

The industrial outlook for 1927 is very promising. The demand for silver for moving picture film and photography is increasing steadily and the amount used for these purposes during 1926 was the largest yet recorded. The most important single factor in silver consumption is the manufacture of sterling silver, in which field producers, refiners and dealers are co-operating with manufacturers in an endeavor to increase sales.

In England silversmiths used about 4,000,000 ounces, and producers of nitrates about 2,000,000 ounces. This total of 6,000,0000 ounces compares with 5,000,000 ounces consumed in 1925, and 4,500,000 ounces in 1924.

The ultimate level at which silver will stabilize depends upon various factors, namely, the possible sales of silver by the Indian Government, the likelihood of restricted production in the event of lower prices, the revival of demand for coinage, the continuance of large importations by China, and the probable increased consumption on the part of India at lower rates; but at the present time it is impossible to predict the future course of the market.

Silver Alloy

A silver alloy that has all the characteristics of Sterling silver both in manipulation and color and which will roll, spin, stamp and solder under exactly the same conditions as Sterling silver, in the many ramifications for the silver trade, castings or otherwise, is made as follows:

A base alloy is first made by melting together 77 parts copper and 20 parts nickel under a cover of borax glass. When fused good and hot, add 3 parts of an alloy composed of 75 parts aluminum and 25 parts manganese. Stir this well and pour into ingots or granulate it by pouring in water, stirring at the same time. Take 50 parts of this and melt it down under borax glass and when fused add 50 parts of fine silver. It will be noted that this alloy contains no zinc and it can be remelted without loss or fuming. While this is as good for the purpose of Sterling, it should be understood that it is not of lawful fineness and must be stamped according to its fineness.—E. D. GLEASON.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

THE FOUNDRY BUSINESS

In this issue on page 65 is an article entitled What Is Wrong With the Foundry Business, by Harry D. Neach. This article presents the results of a survey of the foundry industry in New England, the Middle Atlantic States and the Middle West.

Since the close of the war everyone in contact with foundries has known that there was something wrong with them. During the war no one had time to investigate or think of anything but production regardless of price. Now, however, conditions are changed. The United States is heavily over-supplied with jobbing founderies. As a result, competition has become keener and keener, and has finally reached the point of becoming cut-throat in character.

The basic reason for the troubles of the foundrymen is, of course, over-capacity. But there are other reasons which make them more susceptible and more easily injured by this surplus capacity. Some of them, as listed by Mr. Neach, are as follows:

1. The entry into the jobbing business by regular manufacturing plants who have found themselves with more capacity than they can use.

2. These plants use jobbing work as a filler; they often leave out their overhead from their quotations, figuring that the overhead is carried by their regular product. As a result prices are cut to a point where the regular jobbing foundry has to lose contracts or lose money in taking them.

3. Another important reason is that a large proportion of the foundries have no adequate, working cost system. The rule-of-thumb methods employed cause the owners of these foundries to accept work at prices which mean nothing but ruin.

4. The character of the average foundry operator is such that he is in a poor position to cope with shrewd buyers of castings. These buyers are as a rule sellers of finished products, with a good understandings of merchandising methods. They are experts in shopping around for low prices and in selling specialties to the general public. The foundryman, on the other hand, is a good technician; he knows how to run his furnaces, make moulds and pour good castings. But he does not know how to sell to advantage; nor does he know how to keep his backbone straight in the face of unfair competition.

Mr. Neach suggests as an aid to the jobbing foundry, first, the use of good practical costing methods to warn the foundryman when prices have dropped to the point where profits are no longer possible. This recommendation we heartily second and urge upon all our readers. In addition, he believes that the jobbing foundry should develop specialties to sell directly to the consumer. This means carrying the battle into the camps of the specialty manufacturers who have gone after jobbing work. It is not an easy course to follow as it calls for expansion of sales organization, the search for and taking up of new ideas which are always risky and subject to a high percentage of failure. There is no doubt that a good specialty is a strong prop to any business, but in starting out along these lines, the foundryman should remember that only a small percentage of ideas brought to him will be worth taking up, and even those ideas which are good carry with them problems, in many cases altogether new in character to the foundryman's experience, often requiring large investments, and leading him into other lines of business with which he is unfamiliar. This is not intended as discouragement, but simply as a warning to be careful.

If foundrymen would develop better understanding of business methods and a fair consideration for their trade, which includes their competitors as well as themselves, in time a strength would grow in the industry which would automatically protect it.

RESPONSIBILITIES OF INDUSTRY

It is a general rule for people to hold others to account for their duties. Responsibility is always something with which to impress someone else. It was refreshing therefore, to hear Gerard Swope, president of the General Electric Company in a speech before the Associated Business Papers, outline the responsibilities of modern industry, pointing out the burdens which he, in common with men in similar positions, should and do assume.

The first responsibility is to provide service at minimum cost. This does not mean cut-throat prices, but rather "the application of intelligence and science to the problems of manufacturing and the introduction of better methods in industry, so that without reducing the earnings of labor they can still reduce the selling prices to the public." To be sure the assumption of this responsibility carries with it its own reward. By reducing selling prices, the manufacturer is enabled to reach a very much larger circle of purchasers, increasing his volume of production and consequently making it possible to decrease his costs. By the exercise and enlightened selfishness all parties concerned are benefited.

The next responsibility is adequate compensation to labor. This means the combination, as far as possible, of good earnings and low costs, to be achieved by good equipment and good output. According to Henry Ford this is also a profitable philanthropy as it results in increased general purchasing power which broadens markets.

The next responsibility is the provision of better homes and giving workers the opportunity of buying them. This is closely linked to the problem of teaching men thrift and careful investment. In other words after paying good wages, all possible assistance should be given to see that these wages are not lost.

The problem of unemployment is another which Mr. Swope placed on the shoulders of employers, but this is admittedly far from being solved and can be improved only by "a concerted effort on the part of the industry as a whole and of the community as a whole."

A most important responsibility of modern industry is to industry itself. This includes the many questions of business ethics, taking a share in co-operative enterprises to improve conditions throughout the industry, and carrying on business in such a way as to command the respect of competitors as well as creditors, customers and employees.

The program which Mr. Swope laid out is not a small one but ideals should be set high to be worthy of the name.

COPPER CONSUMPTION

The figures for the consumption of copper in 1925 and their distribution into various lines bring some interesting facts to light. The following table comparing the years 1923 to 1925 inclusive are given as representative of a comparatively normal period. The numbers represent tons of copper consumed, but it must be borne in mind that a large part of this consumption is in the form of alloys, such as brasses and bronzes of various kinds and even aluminum-copper alloys:

	1923	1924	1925
Electrical manufactures	178,500	195,500	183,500
Telephones and telegraphs	75,000	80,000	86,000
Light and power lines	85,850	90,000	106,000
Trolley wire	6,250	5,100	6,650
Wire and rods n. e. s.	49,500	60,000	63,000
Wire cloth	4,000	4,000	4,700
Steam railways electrified	450	800	1,000
Automobiles	103,900	93,700	106,400
Automobile brake lining	1,200	1,250	1,350
Buildings	38,050	40,450	46,700
Locomotives	6,300	3,350	2,200
Railway cars	10,250	7,150	7,150
Air brakes	2,900	2,900	2,000
Ships, commercial	2,600	2,100	2,100
Ships, naval	3,450	2,150	800
Bearings and bushings	41,200	34,550	35,000
Valves and pipe fittings	20,000	21,000	24,100
Ammunition	6,400	4,600	5,500
Lubricators, etc.	3,000	3,300	6,000
Condensers	2,400	1,800	1,550
Fire-fighting apparatus	2,800	2,850	3,100
Agricultural machinery	450	500	650
Cash registers	500	400	450
Copper-bearing steel	1,150	1,200	1,200
Coinage	650	500	900
Radio receiving sets	1,800	2,250	4,000
Clocks and watches	3,350	3,800	4,200
Washing machines	3,000	3,100	3,300
Water heaters, household	2,900	3,400	3,600
Water meters	.....	.....	3,500
Refrigerators, electric	.....	.....	13,600
Other uses	27,250	39,700	42,000
Manufactures for export	52,100	54,100	56,300

Aside from the healthy growth of domestic consumption shown by those figures (export figures remain almost constant), it is worth while to note which industries have grown and which have declined in their use of copper. Electrical manufactures, including generators, motors, swichboards and lamps have fluctuated, but at high levels; telephones and telegraphs show a steady growth; also light and power lines, trolley wire, wire and rods, the electrification of steam railways, buildings, valves and pipe fittings, lubricators, fire-fighting apparatus, radio, receiving sets, clocks and watches, washing machines and water heaters. Electric refrigerators which were almost nonexistent as far as the public was concerned before 1925, consumed 13,600 tons in that year.

Lines that fell off were notably railroad supplies and marine parts. It is well known that marine building has been slow for a number of years. Railroads, however, have simply been holding off in their buying and should come back into the market for heavy tonnages in the near future. Automobiles flucuated, as might be expected, but also at very high levels.

By and large, the general tendency throughout industries not affected by severe depressions, seems to be to increase their use of copper.

This may be attributed partly to normal growth, but to a fair extent to the activities of the campaign of the copper producers in educating the public to the advantages of the red metal. Particularly notable is the case of the large increase in the use of brass piping for buildings.

The history of domestic copper consumption since 1921 has been one of steady, uninterrupted growth, the consumption per person rising from 8.49 pounds to 14.40 pounds, according to the American Bureau of Metal Statistics. The prospects are as good if not better than ever, unless a general recession of business should retard the growth.

TELEPHONE PROGRESS

In a day of startling industrial development when each branch of industry seems to be taking its turn at breaking all records and making revolutionary advances, the telephone keeps its place, either at or near the head of the procession. Almost daily we are informed of new direct wires between points of longer and longer distances. The last was the high speed connection between New York and San Francisco.

Almost immediately after this installation it seemed, announcement was made of the newly opened trans-Atlantic wireless telephone service. The simplicity of this service was one of the most unusual things reported. A caller merely lifted the receiver off his telephone and asked for long distance in the usual way. After giving a London number or name and address, he hung up and waited for the ring to tell him that his connection was ready. One week after the official opening, London could be reached from any telephone in New York State, and in two weeks, from any point in New England. Rapid extension of this service is going on.

It is useless to comment on the wonders of electrical development as each subject seems to be only a preparation for something unknown which will eclipse it in a very short time. We cannot help keeping in mind, however, that without metals nothing of this sort would be possible. Even wireless is as dependent upon metals and as helpless without them as the wire-using telephone and telegraph lines.

GOVERNMENT PUBLICATIONS

Abrasive Materials in 1925. By Frank J. Katz. Bureau of Mines, Washington, D. C. Price 5 cents.

Lead and Zinc Pigments and Salts in 1925. By J. A. Stader and A. Stoll. Bureau of Mines, Washington, D. C. Price 5 cents.

Secondary Metals in 1925. By J. P. Dunlop. Bureau of Mines, Washington, D. C. Price 5 cents.

Mercury in 1925. By J. W. Furness. Bureau of Mines, Washington, D. C. Price 5 cents.

Magnesium and Its Compounds in 1925. By J. M. Hill. Bureau of Mines, Washington, D. C. Price 5 cents.

Annual Report of the Director of the Bureau of Mines to the Secretary of Commerce for Fiscal Year Ended June 30, 1926. U. S. Department of Commerce, Washington, D. C.

Lead in 1925. By J. A. Stader and A. Stoll, Bureau of Mines, Washington, D. C. Price 5 cents.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

Lead Poisoning

To the Editor of THE METAL INDUSTRY:

We note in your November issue that in a New York brass foundry four men have died from lead poisoning from working around high lead alloys.

Inasmuch as we manufacture quite a lot of high lead alloys, we should like to obtain more details of this case. We desire particularly to know if the men died from inhaling the fumes from the molten metal, or if it was from some unusual process used by this particular plant. Also, has it been definitely determined that lead poisoning was the cause of their death, and if so, what are the characteristics of lead poisoning.

We are also interested in the methods taken for ventilating the foundry in question, and if the foundry was not ventilated properly would proper ventilation have prevented the deaths?

We consider our foundry very well ventilated, but any proposition that is apt to cause the death of any of our men, we naturally desire to eliminate, either by taking due precautions or by the elimination of this type of work from the shop.

We might add that we have been making this metal for about sixteen years, and to our knowledge no one has been seriously affected by it, although we had a man die last year and the doctors attributed his death to pneumonia.

We hope to hear from you at your early convenience, or if you are not able to give us any information, you will put us in touch with someone who can.

December 17, 1926. BRASS FOUNDRY.

To the Editor of THE METAL INDUSTRY:

I do not have the details of the cases mentioned in my letter published in THE METAL INDUSTRY. The name of the concern was not disclosed by the inspector, and Rensselaer County, New York, was only given as the location. The State Insurance Fund and, or, the Bureau of Vital Statistics, Albany, N. Y., would have this information. They may give it to you, but I doubt it. I have no doubt the cause of death was definitely determined.

Lead poisoning and death can occur by the inhalation of fumes as was shown during the past year by reported cases occurring in the Standard Oil Company's plant at Bayonne, N. J., in combining an inorganic compound of lead with gasoline. I do not think that the poisoning is due entirely to inhalation of the fumes of molten metal, but the fumes are certainly a contributory cause. Lead poisoning is of frequent occurrence in the glass decorating and pottery industry by the use of dry dust or powdered lead glass as a flux and for ground laying, etc. The hospitals in Trenton, N. J., have a long and a large knowledge of that subject. Lead poisoning known by the old name of "Painter's Colic," is an occupational disease of painters, and is supposed to be acquired by absorption through the skin and underneath the finger nails when using white lead paints. The painters' labor unions in your own town would be a good center of information on that subject.

Foundry workers in high lead alloys are exposed to all of the different ways that the workers in other trades using lead or lead products can be exposed to it. For poisoning can occur through inhaling the fumes from molten metal, through the inhaling of dust of sand that has been impregnated by pouring the leaded alloy into the sand, or by abrasion of the metal by the sand. The molder can acquire it in pouring off by inhaling the fumes or handling the sand in making the molds. The helper can acquire it by inhalation of fumes, by cleaning the castings from sand, and from the fine dust of the metal when grinding the stubbs and gates from castings and from working in the sand. I have had direct knowledge of several cases of lead poisoning and feel that it cannot be prevented if high lead alloys are manufactured steadily in a foundry.

Lead poisoning is very insidious at first, and it is sometimes called indigestion, constipation, rheumatics, run-down condition, etc., until it has accumulated in the system. Then when it is too late the symptoms are so characteristic that it does not need an autopsy to determine definitely the cause of sickness or of death. To get all of the symptoms of lead poisoning I would refer you to "Hering's Materia Medica" under the heading of "Plumbum."

The first characteristic symptom is the blue line on the teeth at the margin of the gums. The next is colic and constipation, then extreme anemia, partial paralysis and then death. If a recovery is made, it is usually a slow recovery from pains through the body and limbs, generally leaving semi-paralysis.

One case did not have a passage in nine days, though laxatives and enemas were used. A case with the above symptoms and extreme anemia with loss of strength and weight came down from 240 lbs. to 130 lbs. Another two cases, one a helper, one a molder, had all of the above symptoms when taken to the hospital. In six months they were discharged. When discharged they had paralysis of the extensor muscles of the arms, the left being most affected. When they visited me three years later these two cases had **not** recovered use of the arms. I have not seen them since, and they are probably dead. Three of these men had left my employ under the inducement of higher wages. Each of these men was strong, healthy, vigorous, young and ambitious. To me they were especially sad cases.

I have known other cases of lead poisoning, but the above were sufficient to make me stay away from the manufacture of high lead alloys, although I have been able to make them successfully for twenty-five years, and they would have been very profitable to make. I don't want to die to win.

The average brass foundrys do not pour higher than 10% of lead and, as an average, their use does not exceed 4% of lead in the whole of their products including the 10% alloys they may make. They invariably use tin in the alloy which may neutralize the lead to a greater or lesser degree. And where much aluminum castings are made the use of lead may not average as much as 4% of the whole of the product. If the exposure to lead is low and tin is also in the alloy the effect on the health appears to be negligible. This seems to be proved by an old friend of mine, John Horning, of Rockville Centre, L. I., who, practically every working day, poured the above average alloys from 14 years of age until he was 81 years of age—that is 67 years—and is still vigorous, both mentally and physically.

That is the reason I have made protest against including the **high lead** alloys manufacturers with the brass foundries for employers' liability purposes. They are not **common** to the brass foundry industry, and I hope they never will become **common** to the industry. They are as dangerous to the health of workers as the old phosphorous matches were in the match industry. I do not believe the manufacture of phosphorous matches is classified with the lumber industry.

New York, January 10. 1927. THOMAS HARPER.

ZINCING vs. GALVANIZING

The following letter is in answer to the editorial on page 506 of our December, 1926, issue, and Mr. S. S. Tuthill's letter on page 28 of our January, 1927, issue, on the subject of the nomenclature of zinc coating processes. Mr. Flanders, the author of the book "Galvanizing and Tinning," speaks for the present terms of these processes.—Editor.

To the Editor of THE METAL INDUSTRY:

There is some justification for the term "galvanizing," which is found in Webster's Dictionary.

We speak of "galvanized iron." This is an old and well-established name for sheets coated with zinc by the hot dip process. If we were to refer to this material as "zinced," it would not necessarily mean that the coating was applied by the hot dip process as any ferrous metal can be coated by several different processes.

While admitting that the term "zincing" describes the process of coating with zinc by the hot dip process more accurately than the term "galvanizing," I am of the opinion that it is too late to make the change that Mr. Tuthill suggests. Neither am I thoroughly convinced that the change he suggests is desirable.

It would be highly interesting to know what view concerns engaged in the hot galvanizing business take of this matter.

Branford, Conn., January 26, 1927. W. T. FLANDERS.

New Books

Engineering Metallurgy. By Stoughton and Butts. Published by McGraw-Hill Book Company. Size, 6 x 9, 441 pages. Price payable in advance, $4.00. For sale by THE METAL INDUSTRY.

Engineering Metallurgy has for its purpose the bridging of the gap between engineers and metallurgists. Special emphasis is laid, however, on teaching engineers such metallurgy as will be of value to them. In other words, it is to acquaint engineers with the origin, extraction, properties and uses of one of the most important materials with which they have to work. Consequently an enormous mass of material covering all conceivable branches of metallurgy must be covered as completely as possible but briefly and in simple language.

The result is a book which is of great value to students and engineers who are not metallurgists. It is inevitably sketchy and not to be compared with detailed works on metallurgy for the specialist, but of course, this is not its field. The purpose which it has, as outlined above, it fulfills very well.

Among the special subjects covered are: Metals and Other Materials of Construction; Examination and Testing of Metals and Alloys; How Metals Occur in Nature; General Methods of Obtaining Metals and Refining Them; Electrometallurgy; Adapting Metals and Alloys to Engineering Use; Alloys; Properties and Uses of Common Non-Ferrous Metals; Processes for Producing and Refining Non-Ferrous Metals; Corrosion and Its Prevention; Fuels and Combustion; Pyrometry: The Measurement of Temperature in Industrial Operations.

Applied Budgeting. By H. Bruere and A. Lazarus. Published by A. W. Shaw Company. Size 5½ x 8, 243 pages. Price, payable in advance, $7.50. For sale by THE METAL INDUSTRY.

Applied Budgeting begins with a series of principles, which, it is stated, apply to every type or variety of business. These principles, which are elaborated in later chapters, are summarized as follows:

1. Restrict the budget period to a term for which dependable estimates may be prepared.
2. Provide for flexibility in adjustments in accordance with need.
3. Base sales quotas on an independent analysis of the market.
4. Ensure a careful preparation of all other estimates and place responsibility for making them on persons who have administrative responsibility for securing results.
5. Have the budget follow the organization line and the organization line meet the requirements of budget accountability.
6. Enlist, to the greatest possible extent, the interest of executive subordinate officials and other responsible factors of the organization, in the preparation of the estimates affecting their work.
7. Keep the procedure as simple as possible.
8. Provide for frequent comparisons of estimates with results.
9. Make the estimates actual commitments and not mere aspirations.
10. Enforce the budget as against every circumstance, except the logic of business facts.

The rest of the book consists of definite and concrete methods for budgeting in various industries, such as railroads, oil, etc. One of these chapters is a description of budgeting methods for metal working industries, particularly those industries manufacturing specific products or specialties rather than contract or special order work.

The importance of budgeting needs no explanation and this book is an unusually practical and direct treatise on this subject. Numerous forms are given which are also of value.

Metallographic Researches. By Dr. Carl Benedicks. Published by McGraw-Hill Book Company. Size, 6 x 9, 307 pages. Price, payable in advance, $4.00. For sale by THE METAL INDUSTRY.

Metallographic Researches is a compilation based on the course of lectures delivered in the United States by Dr. Benedicks during his visit and tour, on the invitation of the Institute of Metals Division, A. I. M. E.

The book discusses the theoretical considerations in metallography and also includes a considerable part on the laboratory technique in examining micro-structures. Much of the book consists of original papers, as they have not previously been published or were published only in part in Swedish.

Among the subjects covered are the following: Some Points of View on the Kinetic Constitution of Solid Matter; Homogeneous Thermoelectric and Electrothermal Effects; Hardness in General and the Hardening of Carbon Steel, High-Speed Steel, and other alloys; Some Improvements in High-Power Microscopy; A Microchemical Etching Method for Metallography; Some Fundamental Factors for Obtaining Sharp Thermal Curves; Action of Hot Wall; A Factor of Fundamental Influence on the Rapid Corrosion of Water Tubes and Related to the Segregation in Hot Metals.

The book should form an indispensable part of every research metallurgist's library and is worth while to every worker in metallography.

Research on "Spotting Out" of Electroplated Finishes

During the past year the American Electroplaters Society has been engaged in collecting from manufacturers, funds to be used for co-operative researches on electroplating at the Bureau of Standards. Their goal is to obtain a fund of $10,000 per year for three years, based on contributions of $50 or more per year from each subscribing firm. To date about $4,000 per year has been raised, and the campaign is being continued by their Research Committee, of which R. J. O'Conner, 1228 Noble Avenue, Bridgeport, Conn., is chairman.

W. F. Barrows, formerly of the Bureau staff, has been appointed as a Research Associate on this fund, and is just starting out on an investigation of the causes and prevention of "spotting out" of electroplated finishes. This difficulty is especially experienced with the so-called "oxidized" finishes on such articles as builders hardware and lighting fixtures, which consist of iron or steel, plated with copper or brass, treated with a sulphide solution, and finally lacquered. The defect is, however, also occasionally observed on silver or gold plated articles, and even on solid brass that has not been plated.

In company with Dr. William Blum of this Bureau, Mr. Barrows recently visited a number of plants and received much valuable information, and samples of both satisfactory and defective products. All the manufacturers visited expressed their willingness to co-operate in this investigation.

The exact course of the researches will depend upon the information derived from the preliminary study now in progress. The indications are that numerous factors may be involved, such as porosity of the cast or rolled metal, or variations in the methods of cleaning, plating, rinsing, "oxidizing," and lacquering the articles, or in the nature of the materials used in wrapping, or in the conditions of storage exposure or use. A considerable period will undoubtedly be required to determine the relative effects of each of these possible factors.

In order that this investigation may be made as comprehensive as possible, the Bureau will be glad to receive typical samples of spotted products, with full information regarding their origin and history.

When additional funds are available, the Electroplaters' Society expects to support additional researches on electroplating at the Bureau of Standards.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

BLACK NICKEL

Q.—I am desirous of receiving information regarding black nickel plating. At present I am using 10 oz. double salts; 2 oz. sodium sulpho-cyanate; 1 oz. zinc sulphate, per gallon. I use nickel carbonate to neutralize; old anodes, 1 volt, 60° F. temperature. The product to be colored is nickel silver in the form of a mesh curtain about 14-in. by 28-in. My plate comes spotty and streaky with a brown cast to it.

A.—The formula you mention for black nickel plating is approximately standard, though as a rule 8 ozs. double nickel salts is ample per gallon of water. Do not add nickel carbonate as a neutralizing factor because if used dry it does not dissolve in the solution. A better procedure is to dissolve enough copper carbonate in aqua ammonia so that a clear blue solution results. The addition of half a fluid oz. per gallon of black nickel solution will produce a clear, bright, black deposit. It might be advisable to reduce the solution as it now stands by removing 1/3, then adding clean cold water. Add small amount of muriatic acid, ⅛ oz. or more per gallon of solution until it becomes only faintly acid to blue litmus paper test. Try out the solution and note results. The ammonia copper solution can now be added. To remove the brown tone, immerse the articles in a solution consisting of: water 1 gallon; chloride of iron 2 ozs; muriatic acid 1 oz. All that is required is just a moment's immersion to remove the brown tone, then wash and dry the articles as usual.

Operate the black nickel solution at 80 to 90 degrees F. for the best results.

For your purpose the following formula for black nickel solution should give ideal results:

Water	1 gal.
Nickel chloride	6 ozs.
Ammonium chloride	6 ozs.
Sodium chloride	2 ozs.
Rochelle salts	1 oz.
Zinc chloride	¾ ozs.

C. H. P. Problem 3,603.

COPPER AND GOLD ON PEWTER

Q.—I am plating pewter with a copper solution and using dry batteries. The metal will not stand and turns very black.

Can you tell me where I can buy a Smee or a Daniel battery? What is the best copper solution for plating cold with the above batteries? Please give me a formula for making my own gold solution to plate with batteries, using 24-K fine gold. How can I make it a light or dark shade and make it more copperey-looking? I want to make one-quarter of a gallon of solution at a time; both copper and gold solutions to be plated cold.

A.—Dry cells are not satisfactory for plating purposes; they run down too rapidly. Wet batteries are best. You can purchase an Edison Le Lande battery which will give excellent results. It is advisable to use two, of 1-quart size, and connect in series to obtain sufficient voltage. An excellent storage battery can be purchased from any good radio store. Two or three of these batteries connected in series will give you a satisfactory plating current density. For gold and copper plating solutions, see Platers' Wrinkles.

Gold solutions are best operated at 160° F. You will be unable to obtain the results you wish with a cold gold solution. Copper solution can be used cold, but best results are obtained when the solution is heated to 120-140° F. The secret in plating pewter is a clean surface. Old pewter should be cleansed in a hot cleaner prepared as follows: Water 1 gallon; caustic potash 4 ozs.; bichromate of soda 2 ozs. As soon as the oxide becomes soft, remove the articles, wash in water, then scratch-brush wet. Add a little bicarbonate of soda to the scratch-brush water, then plate as desired. Data covering the manufacture of wet batteries can be found in the "Scientific American Encyclopedia" Local Notes and Queries. This work can be found in any public library.—C. H. P. Problem 3,604.

GRAY ON METAL

Q.—Can you please tell me if there is any black oxidizing for aluminum sheets? I would like to know how to make a gray finish for any metal.

A.—The best method to use in producing a black finish on aluminum is to black nickel plate the aluminum. The following solutions will be found satisfactory for the purpose.

Water	1 gallon
Double nickel salts	8 ozs.
Sodium sulphocyanide	2 ozs.
Zinc sulphate	1 oz.
Ammonia 26°	⅛ oz.

Water	1 gallon
Nickel chloride	6 ozs.
Ammonium chloride	6 ozs.
Sodium chloride	2 ozs.
Rochelle salts	1 oz.
Zinc chloride	¾ oz.

To prepare the solutions, dissolve all the salts in hot water 180 deg. F., in the order given. When the solutions cool to 80 deg. F. they can be used. Anodes: rolled or cast nickel.

For gray finishes on most metals, prepare a solution consisting of water, 1 gallon; hyposulphite of soda, 8 ozs.; lead acetate, 4 ozs.; soda ash, 58%, ½ oz. Immerse the metal articles which must be clean and bright in the solution for a minute or two until they become gray black. Temperature of solution 180 deg. F. After the necessary relieving has been done on the articles gray-finished, then lacquer to protect the finish.—C. H. P. Problem 3,605.

GREEN GOLD

Q.—Will you please give me a formula for a bright grass green gold color on jewelry; also mesh bags. Would also like a smut for the above.

A.—The following solution should give the desired results.

Water	1 gallon
Sodium cyanide	2 to 3 ozs.
Sodium gold cyanide	⅝ oz.
Cadmium oxide	¼ oz.
Silver cyanide	⅛ oz.
Caustic potash	½ oz.
Sal-ammoniac	½ oz.

Temperature 80 to 100 deg. F. at 3 to 4 volts. To prepare the solution, dissolve the materials in the order given in 1 quart water at 180 deg. F., then add the balance of the water cold. It should be remembered that gold and cadmium produce the best and richest green gold deposits. An excess of silver produces pale green deposits. To produce antique green gold: dissolve 2 ozs. caustic potash in 8 ozs. hot water, then add 2 ozs. lead acetate. Add as much of the lead solution to the above green gold solution as required to produce a smut gold. After plating relieve the smut with bicarbonate of soda. —C. H. P. Problem 3,606.

OLD ENGLISH FINISH

Q.—Kindly send me formula for either electro-plating or dip finish on brass in the early English finish.

A.—There are two types of solutions. One is made up from water, 1 gal.; caustic potash, 4 ozs.; red sulphide of antimony, 1 oz.; temperature 180 deg. F.

For the other, add golden sulphide of antimony to aqua ammonia 26 deg. F., heated to 120 deg. F., until a satisfactory dark brown finish results upon the brass.

The cleansed brass articles with a polished surface should be immersed in either solution until the desired shade is obtained. Then remove, wash, dry, finish in relief and lacquer.—C. H. P. Problem 3,607.

ORANGE COLOR ON BRASS

Q.—We are making brass water valve for instantaneous water heater that requires a golden bronze in the casting. We have tried out different mixtures and also different time of shaking out; Also dipped in a cold water bath shortly after being shaken out but do not seem to be able to get the results. Have you any information that would enable us to accomplish the results desired?

A.—The method used by the valve foundry to get the natural color similar to what you desire, is to use good metal: 85 copper, 5 tin, 5 lead, 5 zinc is the standard mixture. Another, not expensive, is, 82 copper, 3 tin, 5 lead, 10 zinc. Dip the castings in water about three minutes after being poured. The process is known as blowing out; that is the core is blown out of the casting by striking against the side of the tank which causes the core to explode and this leaves a very clean cored casting. A little practice by your molder will gave you the desired color. If you are using scrap material you will not get a good color, in fact to get any color near the color so much desired in this class of work it is necessary to use at least 10% new copper. Your mixture can be 90% scrap valves, etc., and 10% copper new ingot. However, the best color is produced by using new metal and a molding sand free from pitch and core compounds. Flour the mold well on the drag side and the cope very slightly. If you will follow the above you should not have any trouble getting the golden bronze color, or as is known to the trade, the "orange color." —W. J. R. Problem 3,608.

PITTED NICKEL

Q.—I am having trouble with nickel pitting. Could you give me advice for stopping same? The solution is a hot nickel I made from single nickel and chloride and boracic acid. It runs 22 Baumé, slightly acid, and 120 deg. F., run at 6 volts. I am plating automobile bumpers and have agitators on each tank. I have used hydrogen peroxide and acetic acid. I am filtering while running the tanks. What conductive salts, if any, should I use?

A.—We suggest the following additions per gallon of solution. 1. 2 ozs. ammonium chloride. If pitting still continues, then add direct to the solution at the close of the day's work, ¼ oz. sodium perborate per gallon. You can dissolve it in hot water before adding to the solution, or direct. 2. If after adding the sodium perborate, the pH is too high denoting that the free acid has been neutralized by the sodium perborate in excess, then add hydrochloric acid in small proportions to restore the original acidity or pH value.

You can probably add ⅛ to ¼ oz. acid per gallon.—C. H. P. Problem 3,609.

PLATING ON LEAD

Q.—Please give me some information on cleaning lead and plating.

A.—The best cleaner for lead and pewter is a solution consisting of: water 1 gal.; caustic potash 4 ozs.; sodium bichromate 2 ozs.; temperature 180 deg. F. Immerse the leaden articles in the solution for a short time, then remove and scratchbrush wet. To the brush water, add a small amount of bicarbonate of soda; 1 oz. per gal. of water will be ample. You can then plate the lead or pewter under usual conditions. These suggestions apply to the cleansing and plating of old and worn articles made of lead. If your product to be plated is new and made of antimonial lead, then clean from grease in above cleaning solution or any good cleaner. Wash thoroughly in water; immerse in a cyanide dip, then re-wash in water. Coat the antimonial lead articles in a hot copper cyanide solution for a few moments, coat over with a nickel deposit for a few minutes. Then re-wash in water and plate in an acid copper solution as follows:

Water	1 gal.
Copper sulphate	28 ozs.
Sulphuric acid	4 ozs.
Yellow dextrine	⅛ oz.

After copper plating in the acid copper solution you can plate with any other metal. For silver plating antimonial lead, copper and nickel plate as outlined. Use the silver strike solution to coat over the nickel deposit quickly, then silver plate in a regular silver cyanide solution. See "Platers' Wrinkles" for solution, formula, etc.—C. H. P. Problem 3,610.

POLISHING MACHINE EXHAUST

Q.—I have a combination polishing and grindstone machine. On the polishing spindle of the machine, I wish to have an exhaust blower attachment. Can you please give me information as to how I can set up an exhaust blower attachment for the particular machine mentioned.

A.—A small exhaust blower to attach to the spindle of a polishing lathe should be made up as follows: Two small bronze arms should be made up so that three or four sheets of aluminum may be attached similar in arrangement to the paddle on an old-fashioned steamboat. The paddle fan so built would have to be enclosed with thin sheet steel and so formed that the suction will enter the enclosure at the bottom and discharge at the top. The motion would have to be towards the discharge outlet.—C. H. P. Problem 3,611.

PROTECTING PLATING RACKS

Q.—We are interested in eliminating nickel deposits on our plating racks and would be very glad to receive any information that you may have in regard to this.

A.—There is only one way to keep the nickel or other metal from building up on your plating racks. That is to strip them every day. In large plating departments an electro-strip is maintained in constant operation so that each day the racks are stripped free from deposits. The solution used consists of the following:

Sulphuric acid 66 deg F., 9 parts;
Water, 1 part;
Glycerine, 1 oz. per gal. of acid and water.

Cathodes of sheet lead or copper which should entirely surround the tank on all sides should be used. The racks to be stripped become the cathodes so the current conditions are just the reverse of plating voltage 6; amperage as high as possible. Strip your racks each day for best results.—C. H. P. Problem 3,612.

ZINC CYANIDE SOLUTION

Q.—We are using a four-volt generator with cyanide solution, heated to about 120 deg. F. We seem to have difficulty in obtaining a sufficient zinc coating on the boxes to withstand the two one-inch immersions in copper sulphate solution, without stripping the zinc.

Is there any solution you could recommend for a cleaner of steel boxes before galvanizing? Probably our difficulty lies there. At the present time we are using sulphuric and muriatic acid with cyanide and a prepared cleaner.

A.—You do not mention the composition of the zinc cyanide solution you now operate. Many American firms which zinc plate similar products to yours (conduit boxes) use the following zinc cyanide solution: water 1 gal.; sodium cyanide 96-98% 4 ozs.; zinc cyanide 4 ozs.; caustic soda 73-76% 4 ozs.; cyanobrite ⅛ oz. The latter is a whitening and brightening factor. Temperature 110 deg. F. Voltage 4 to 5. Anodes consist of an alloy of pure zinc and mercury. You can deposit ample zinc from this type of solution in 10 minutes to withstand two one-minute immersions in a neutral copper sulphate solution termed the Preece test. The methods of cleansing with the materials you mention are correct or as good as may be used. Your entire trouble lies in your zinc plating solution. Your present solution would not have to be discarded. Analysis could be made and the solution then brought up to standard by proper additions or deductions.—C. H. P. Problem 3,613.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,609,967. December 7, 1926. **Process of Refining Tin.** Ludwig Schertel and Willi Lüty, Essen-on-the-Ruhr, Germany.

A process for refining metallic tin, which comprises introducing into molten tin elements the formation heat, of which per unit of oxygen is greater than that of tin, subjecting the molten mass to the action of an oxidizing agent, and removing the impurities from the molten metal by means of the resulting scum.

1,610,362. December 14, 1926. **Process for the Treatment of Iron or Steel for Preventing Oxidation or Rusting.** Thomas Watts Coslett, Birmingham, England.

A process of the kind referred to for the treatment of iron or steel or articles composed or having a surface of iron or steel which consists in subjecting the same to the action of an aqueous solution of acid zinc phosphate and boric acid in the relative proportions of about two ounces of the phosphate and one and one-third ounces of the boric acid to one gallon of water for the purpose specified.

1,610,899. December 14, 1926. **Recovery of Ingredients of Waste Lead-Battery Paste.** Alexander Stewart, Roselle, N. J., assignor to C. L. Constant Company, Hoboken, N. J.

The method of treating waste lead battery paste, which comprises fusing the same with an acid salt of an alkali metal.

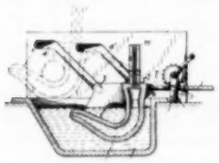
1,610,941. December 14, 1926. **Wash for Sand Cores and Molds for Metal Founding.** Edward D. Frohman, Pittsburgh, Pa.

A wash compound for foundry cores and molds comprised of alumina-oxide, a binder and organic oil.

1,611,043. December 14, 1926. **Metallic Composition.** Wilbur H. Judy, Buffalo, N. Y., assignor to Sumet Corporation, Buffalo, N. Y.

A metallic composition varying in proportions from 1% of purified lead, 75% of copper, and 24% of zinc, to 20% of purified lead, 55% of copper, and 25% of zinc.

1,611,614. December 21, 1926. **Die-Casting Machine.** Emil Thieslack, Berlin, Germany.

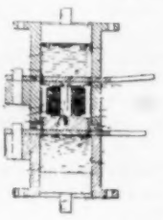


A die-casting machine including a frame, a crucible for containing molten metal, a ladle adapted to be charged with molten metal in said crucible, opposed pairs of trunnions projecting from the ladle the frame being provided with opposed pairs of parallel guide ways inclined upwardly toward the front end of the crucible and terminating in horizontal portions for accommodating the trunnions to effect supporting of the ladle, and means for imparting a sliding movement to the ladle so that it may be elevated along the guide ways without being tilted to a position for discharging the contents or lowering it into a submerged position within the crucible.

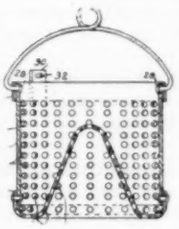
1,612,151. December 28, 1926. **Alloy.** Earl H. Richardson, Ontario, Calif., assignor to Edison Electric Appliance Company, Inc., a corporation of New York.

A fusible alloy consisting principally of a zinc base and substantial amounts, but less than 10% each, of bismuth and aluminum.

1,612,378. December 28, 1926. **Method of and Apparatus for Die Casting.** Jesse L. Jones, Edgewood, Pa., assignor to Westinghouse Electric & Manufacturing Company, a corporation of Pennsylvania.



A pressure casting device comprising a mold adapted to receive a frame in or about which a body is to be cast, a plurality of reservoir associated with said mold, a plurality of communicating ports in said mold and reservoir and pressure actuating means for discharging the reservoir through said ports, said means comprising a plurality of fluid pressure actuated pistons.



1,612,585. December 28, 1926. **Method of Metal Coating.** Albert Jackson, Plainfield, N. J., assignor to Henry B. Newhall, Plainfield, N. J.

A method comprising confining articles in a mass with a vent therein; and dipping the mass into molten metal.

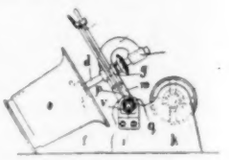
1,612,642. December 28, 1926. **Method of Adding Aluminum to Aluminum-Containing Alloys.** William A. Mudge, Huntington, W. Va., assignor to the International Nickel Company, New York, N. Y.

In the manufacture of aluminum-copper-nickel alloys, the step consisting of adding an aluminum alloy to a molten bath consisting mainly of copper and nickel.

1,612,782. December 28, 1926. **Dental Alloy and Process of Making the Same.** Clarence C. Vogt and John W. Harsch, Pittsburgh, Pa., assignors to Lee S. Smith & Son Manufacturing Company, Pittsburgh, Pa.

A dental alloy containing silver and tin in amounts which will readily amalgamate with mercury to form a suitable hardening dental amalgam, together with a minor proportion of a non-ferrous metal of the nickel group.

1,613,235. January 4, 1927. **Lacquering or Varnishing Apparatus.** Wilhelm Mäueler, Marmen, Germany.



In an apparatus of the character described, a pot mounted to rotate upon an axis inclined to the horizontal, said pot having a normally open upper end, a jacket surrounding the pot and having a normally open lower end, said jacket being spaced from the pot to provide an intervening combustion space and provided at its upper end with exhaust outlets from said combustion space, a gas burner arranged within the base of the jacket and arranged to project its flames against the bottom of the pot and into said combustion space, and means for rotating the pot and jacket.

LOS ANGELES PATENT ROOM

The opening of the Patents Room on September 1, 1926, was announced by the Commissioners of the Los Angeles Public Library. These patent files represent the largest collection west of the Mississippi, and consist of United States, British, Canadian, German and Cuban records. With the added space now available, it is the intention of the Librarian, Everett R. Perry, to build up and complete these files as rapidly as the demand warrants.

TUNGSTEN PATENT INVALID

Judge Hugh J. Morris, of the United States District Court of the State of Delaware, dismissed a bill of complaint filed in 1924 by the General Electric Company against the De Forest Radio Company for the alleged infringement by the De Forest Company of the Coolidge patent on ductile tungsten filament as used in radio tubes and incandescnt lamps, according to an announcment of the De Forest Company, Monday.

This decision was handed down in an action for the alleged infringement of the Coolidge patent owned by the General Electric Company against the De Forest Radio Company, whose counsel, Samuel E. Darby, Jr., had charged that the ductile tungsten and the process of its making was not the invention of Dr. W. D. Coolidge, but the Dr. Colin G. Fink, and that the patent issued to Dr. Coolidge and assigned to the General Electric Company was invalid.—New York Herald Tribune, January 23, 1927.

EQUIPMENT

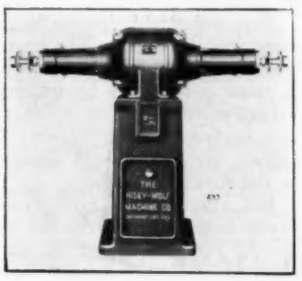
NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

MOTOR DRIVEN GRINDING AND BUFFING MACHINES

The Hisey-Wolf Machine Company, Cincinnati, Ohio, has placed on the market a complete new line of motor-driven double-end grinding machines, buffing and polishing machines with open type spindle extension and buffing and polishing machines with encased type spindle extensions. All of these machines are available for both alternating and direct current, and they offer an assortment of 42 different types and sizes.

The motors for operation within the name plate horsepower rating will not exceed 40° C. temperature rise. In addition special electrical features are included with a number of advantages as regards ease of operation and cost of power.

FLOOR STAND GRINDER



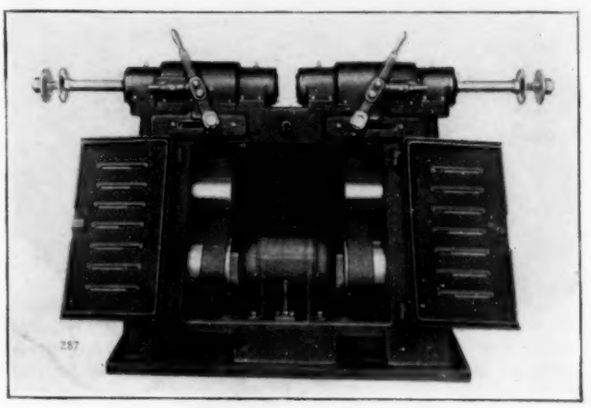
FLOOR STAND BUFFER

The bearings are said to be high grade oversize ball bearings mounted in end heads in close proximity to the wheels. Buffing and polishing machines with encased type spindle extensions are equipped with four ball bearings. All bearings are completely enclosed and protected from dust and grit.

Grinding wheels are of diameters in proportion with motor speeds, to permit safe travel in feet per minute as recommended by American Engineering Standards Committee.

SELECTIVE SPEED BUFFER

By means of belt shifters in rear of both spindles it is possible to stop either spindle independently of the other. Working in unison with the shifter an adjustable brake engages when belt is shifted on loose pulley, thereby holding spindle stationary until belt is again shifted. The belt tension can be easily regulated by the adjusting levers at either end of machine. Further adjustment can be obtained as machine is mounted on a hinged platform equipped with screw adjustment. Two large doors in the rear permit full view and access to entire machine. High-grade over-size ball bearings (12 in all) are used throughout and are provided with liberal means of lubrication. Full safety automatic motor starter with push button control is standard equipment. Spindle speeds as listed have been found best for average work; however, other speeds of 2,400, 2,600 or 3,000 R. P. M. can be furnished. If desired, spindles can be provided with a different speed on either end.



REAR VIEW OF SELECTIVE SPEED BUFFER

MOTOR DRIVEN FLOOR GRINDER

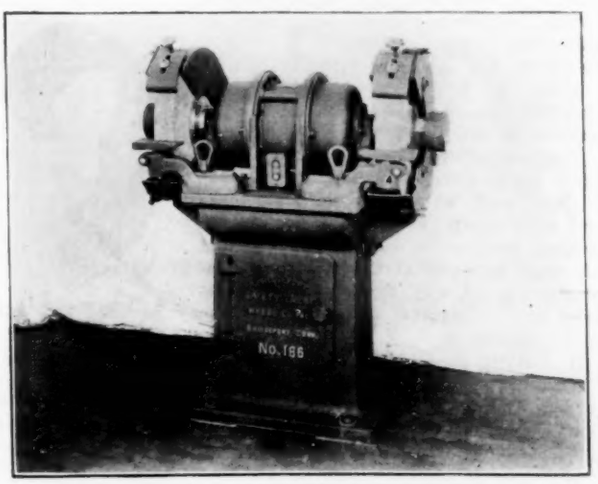
The Bridgeport Safety Emery Wheel Company, Bridgeport, Conn., has recently placed on the market a new floor grinder, motor driven, using alternating current.

General utility floor grinders must operate under all kinds of conditions. They must operate properly with little or no attention outside of being supplied with new wheels as the old ones wear out. This line of grinders, it is claimed, have incorporated in them just the qualities which produce that kind of dependable service.

Motors used are General Electric make, squirrel-cage type. These motors are built according to A. I. E. E. specifications, and are thoroughly dependable. The stator insulation successfully withstands temperatures well above the A. I. E. E. limit of 90° C., together with abrasive dust, moisture, acid or alkali conditions and foreign matter generally, which causes breakdown of ordinary insulation. These motors will regularly take an overload of 25% with a temperature rise of not over 55° C.

The ball bearings are bench mounted on the spindle and locked by individual lock nuts. The spindle size is carefully inspected for exactly the right ball bearing fit. The bearing housings are sealed in such manner as to best retain the oil and exclude grit and foreign matter. One of the best makes of bearings is used and the sizes are very conservatively selected respecting their load and speed capacities. The bearing housings contain an oil bath of ample proportions in which the bearings run. This bath maintains a continual supply of lubricant for considerable periods of time without attention and is readily replenished when necessary by a sight level oil cup.

The wheel guards are made from steel plate of such weight as to meet the best practice in protection against wheel breakage. An adjustable protective nose piece is provided. These guards are fully adjustable and a nozzle is arranged at the rear for connection to an exhaust system. The outside plates of the guards are hinged in order to facilitate the ready change of wheels.



BRIDGEPORT A. C. FLOOR GRINDER

BELKE PLATING BARREL

The Belke Manufacturing Company, 2952 W. Van Buren St., Chicago, is now marketing an item of standard equipment, an electrically driven plating barrel, on which a number of improvements over the present type are claimed. The plating barrel, it is said, accomplishes all that the plating barrels now on the market will do, with the addition of many new features.

In the first place, the barrel is entirely electrically driven. It is no longer necessary to find a place for the plating barrel in the over-crowded space underneath power shafts so that they may be raised and lowered by means of pulleys. The new barrel may be placed in any corner and just plugged into the light socket.

BELKE ELECTRICALLY DRIVEN PLATING BARREL

In front of the barrel, and located conveniently so that a man need not change his position, are two switches. One is a double throw, and the other single throw. When the double throw switch is put down, the plating barrel is lowered into the tank, and when the switch is thrown up the plating barrel is lifted to any position convenient for loading or unloading the articles inside. The single throw switch serves to rotate the barrel. Rotation is possible by this means when the barrel is in any position, up or down. This is a very great convenience, as, for instance, when unloading, it will be desired to raise the barrel and then turn it so that the door faces downward, for the articles to be dropped out. All this is possible with the new barrel, merely by operating the electric switches.

The motor turns eight and three-quarter times per minute, which has been found to be the proper speed. It is rotated by means of a gear and chain from one motor, which is independent of the motor which raises and lowers the barrel. It is raised and lowered by means of a worm gear, which eliminates the use of an additional chain.

One additional feature is a method for quickly and easily removing the panels. There are a few screws holding each panel and by taking them out the panel is easily replaced. The door is taken out quickly by turning a quick-action catch.

Fool-proof electrical connections to the danglers insures quick and perfect plating. Heavy copper bars, insulated with hard rubber, are rigidly held alongside of the barrel arm, and connect to the danglers inside.

The studs which give excellent contact to the danglers are firmly held in the barrel, but are quickly removable. The danglers merely rest on the studs, making electrical contact, but allow removal by simply raising them off the studs.

In operating first throw the switch which raises the barrel to the desired height, and the door is unfastened. The articles are then placed in the barrel at any height convenient to the operator. When unloading, the barrel is again raised by means of the switch, and the barrel is then rotated until the door is facing downward. Release the catch and let the articles drop into a basket.

There is an adjustable counterweight which requires no attention, but may be adjusted if desired by the plater. The tank is unusually ample, allowing more than sufficient solution, and the cathode bars are easily accessible for removal.

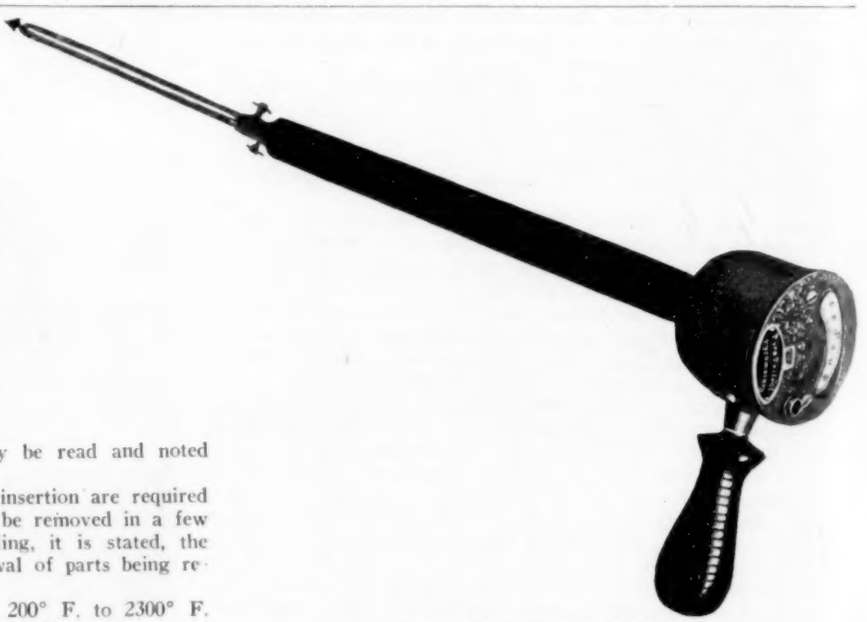
NEW PYROMETER

The Pyrometer Instrument Company, 74 Reade street, New York, has placed on the market a Pyro Insertion Pyrometer, specially adapted for brass, bronze and aluminum foundries. The instrument includes the usual elements of a pyrometer, namely, thermo-couple, indicator and lead wires, but these are all placed in one self-contained and compact portable unit as can be seen from the illustration. The pyrometer is intended to be carried and operated in one hand.

The temperature scale is placed for quick temperature indication and reading. A small push button near the scale operates a clamping device to release the indicating hand or to hold it. By releasing this push button after the maximum temperature is shown, the pointer remains fixed on the correct indication which may be read and noted after withdrawal.

It is stated that only 6 to 8 seconds of insertion are required for correct readings. Thermo-couples can be removed in a few seconds and with reasonable careful handling, it is stated, the instrument should last indefinitely, no renewal of parts being required except the thermo-couples.

This pyrometer is built in ranges from 200° F. to 2300° F. Its weight together with the thermo-couples is 3¾ pounds.



PYRO INSERTION PYROMETER

POWER MOLDING MACHINE

The Milwaukee Foundry Equipment Company of Milwaukee, Wis., has added a new machine to the line of power molding machines. It is a hand ram, power clamp, hand rollover, power draw molding machine. Although its first appearance was at the Foundrymen's Convention at Detroit, one of these machines has been operating successfully, at a good rate of production, for the past eighteen months.

This machine is built either stationary or portable. The clamping head and pattern plate are rigidly mounted on each end of a strong steel tube which is clamped in a cast steel trunnion. The trunnion is supported by two large bronze bearings pressed into a housing which is solidly bolted to the main frame of the machine. The clamping head swings on two large Timken roller bearings. The pattern plate is pressed on the steel tube and locked with two dog point set screws. The steel tube which carries the clamping head and pattern plate is adjusted up or down to balance the load for rolling over. This assembly can be so set that the operator exerts only a small effort to roll over with mold and to roll back light.

The clamping head swings to the left to be out of the way for ramming the mold. After the mold is rammed and bottom board is in place, the head is swung over the mold and air let into the cylinder forcing the platen down against the bottom board, thereby clamping the mold for rolling over. The downward motion of the platen automatically locks the clamping head tight against a stop fastened to the steel tube. This unit is now rolled over by hand to the right, on the bronze trunnion bearings, bringing the clamping head to the bottom. The air is now slowly exhausted from the cylinder, drawing the mold away from the pattern. The draw is accurate by virtue of the platen being guided in the clamping head by two hardened guide pins working in hardened bushings, the clamping head in turn is locked to the steel tube which carries the pattern. The clamping and drawing operations are controlled by the same valve. The mold is now carried away and the machine rolled back ready to go ahead on the next operation.

MILWAUKEE MOLDING MACHINES

The outstanding qualities claimed for this machine are: a quick easy roll-over of heavy as well as light molds, and an accurate machine pattern draw. It can be used for making cores or green sand molds. It is suitable for jobbing work because pattern changes can be made quickly.

MOLDING SMALL INTRICATE CASTINGS

The Osborn Manufacturing Company of Cleveland, Ohio, has recently developed an unusually efficient unit for producing small molds of intricate design, requiring accurate pattern draw. The unit consists of a cope machine and a drag machine.

The cope machine is the standard No. 81 Osborn Jolt Squeeze Stripper Molding Machine which has been manufactured by this company for a number of years, and is widely used for making automobile castings.

In designing the drag machine, much care and expert design was necessary as the drag mold must be rolled over, and yet it is desirable to keep the speed of the machine which does not roll the mold, and is therefore faster. The problem has been solved, it is stated, by the No. 321 type of Jolt Rollover Squeeze Pattern Draw Molding Machine, which performs the following operations:

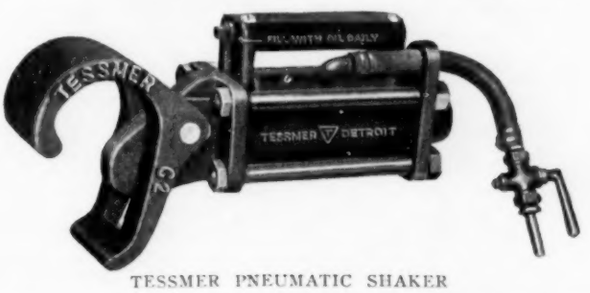
1. Jolt rams the mold.
2. A fast mechanical strike-off always leaves a uniform quantity of sand on top of the mold.
3. The hand rollover is balanced, and rolls the load on the approximate center of gravity. No locking of the rollover table is necessary, as it is slightly off-center and remains firmly in the inverted position.
4. The squeeze completes the ramming of the mold.
5. The pattern is drawn on the down stroke from the squeeze operation with a slow draw and a fast draw position, both being adjustable, that maximum speed consistent with the design of the casting may be obtained, keeping the mold in good condition.
6. The finished drag mold is swung away from under the rollover conveyor attachment. Either roller conveyor or swing frame for removing molds is furnished as desired.

OSBORN MOLDING MACHINE

Probably the rollover type of machine will never be refined to the point at which its speed is equal to that of the cope machine, but this machine, it is claimed, operates at so nearly the same speed as the cope unit, that it does not materially hold back the production of cope molds. The molds may be placed on the floor for pouring, or fed into a continuous system.

PNEUMATIC SHAKER

The Tessmer Machine and Tool Company, Detroit, Mich., manufactures a pneumatic shaker for shaking out flasks, filling barrels or containers, etc. This shaker is equipped with a cam, hinged in a jaw which readily adjusts itself to any thickness and shape up to 3". The cam locks the shaker securely to the pot, flask or container, delivering the maximum vibrations on the forward and return strokes.



TESSMER PNEUMATIC SHAKER

The handle acts as an oil reservoir, which holds sufficient oil to lubricate the piston automatically for one day's run. The end caps, cam and jaw are made of steel. The end cap holding the spring is provided with a taper plug for removing a broken or weak spring without diassembling the shaker. The end caps are held securely to the body with four ¾" steel bolts. The body is made of semi-steel and is equipped with 9" of hose, to which a shut-off valve is attached. Weight of complete shaker is 50 pounds.

THERMOPYRES

The Taylor Instrument Companies of Rochester, N. Y., are making a line of "Thermopyres," a portable hand pyrometer unit for high temperature work. This instrument is intended to meet the demand for a low-priced instrument for intermittent rough checking purposes, above the range of mercury thermometers (950° F.). Their accuracy is plus or minue 20° F. in a range of 2,200° F.

The Thermopyre is of the direct insertion type specially adaptable to small quick-heating furnaces, oil burners, muffles, flues,

TAYLOR THERMOPYRE

galvanizing kettles, etc.; not suitable for a continuous duty or a permanent application. It consists of a 39" calorized special alloy stem for a thermocouple combined with a compact durable millivoltmeter movement in a single unit. The indicator is enclosed in a cast aluminum case with a hardwood handle for convenience in handling. The net weight of the instrument is 4½ pounds.

CROWN PLATING MACHINE

The National Steel Product Company, Dayton, Ohio, is manufacturing a plating machine under the name "Crown."

Crown plating machines are made in two sizes only, No. 1 and No. 2, and below is a list of the various types of machines made.

No. 1—Wood solution tank, panel type mahogany cylinder with belt drive.

No. 1-A—Steel solution tank, all micarta cylinder; belt drive.

No. 2—Wood solution tank, panel type mahogany cylinder, with belt drive.

No. 2-A—Steel solution tank, all micarta cylinder; belt drive.

While the above listings are standard, they can be changed by

CROWN PLATING MACHINE

furnishing any type of cylinder wanted as well as using the speed reducer for belt drive or for electric drive on either the wood or steel tank.

TANK CAPACITIES

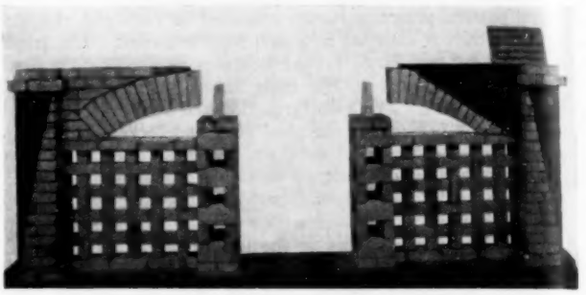
No. 1 Tank—24½ in. x 40½ in. x 29 in. inside measurement and requires 70 gallons of solution.

No. 2 Tank—28 in. x 52½ in. x 31 in. inside measurement and requires 140 gallons of solution.

The illustration shows the type of machine that is generally used, and is adapted for nickel, copper and brass plating. The tank is made of selected cypress, having leaded tongue and groove joints. The cylinder is made of seasoned mahogany, using bakelite panels. An insulated gear drives the cylinder. The electrical conductors are exceptionally large. A patented feature of raising and lowering the cylinder mechanically as well as to make and break the electrical circuit is used, and is an exclusive feature. This type of machine is belt driven.

REFRACTORIES EXHIBIT

At the Midwestern Engineering Exposition (Chicago Power Show), which will be held in the Coliseum at Chicago from February 15th to February 19th, Botfield Refractories Company, Swanson and Clymer Streets, Philadelphia, Pennsylvania, will display two unusual single ring arches, built with Adamant Fire Brick Cement. In these arches, approximately 150 pounds of re-



BOTFIELD REFRACTORY EXHIBIT

fractories are supported by a thin layer of Adamant Cement. In addition, there will be displays of the various uses of Adamant Cement in boiler furnace fire brick construction, as well as data on Adamant service in representative power plants.

In attendance at the Adamant booth (No. 440, located on the main floor, north and south aisle, in the North Hall) will be Axel H. Engstrom, Sales Manager; W. B. Smith, Refractories Engineer, and H. F. Krieg, Chicago representative.

METAL MELTING FURNACE

The U. S. Industrial Engineering Company, Inc., 505 Union Building, Cleveland, Ohio, is marketing an oil-burning furnace for melting brass, bronze and aluminum. This furnace is of the recuperative, pre-heated air type, and is sold with a guarantee that if it does not do as represented within 30 days of operation, it can be returned. Also it is stated that temperatures can be controlled between 350° F. to 3,250° F. without the aid of a skilled operator.

Some of the operating figures obtained with this furnace are interesting. It is stated that on one installation using from 20 to 22 gravity oil, a heat of 210 pounds of brass or bronze was melted in between 30 to 35 minutes with an average oil consumption of 45 to 50 gallons of oil per ton of metal. The furnace can be easily adapted for gas as well as oil and a wide range of oils of varying gravity can be used.

EQUIPMENT AND SUPPLY CATALOGS

Styrian Steel Rolls. Erie Steel Corporation, New York.

Review of the Silver Market for 1926. Handy and Harman, New York.

"Bad Air Is Bad Business." American Blower Company, Detroit, Mich.

Arc Welding Accessories. General Electric Company, Schenectady, N. Y.

Bricks and Bouquets. Laclede-Christy Clay Products Company, St. Louis, Mo.

Welding and Cutting Apparatus. The Alexander Milburn Company, Baltimore, Md.

Raymond Automatic Pulverizers. Raymond Brothers Impact Pulverizer Company, Chicago, Ill.

Theory and Practice in the Hardening Shop. Automatic and Electric Furnaces, Ltd., London, England.

"Stampings Are Cheaper Than Castings." Geuder, Paeschke and Frey Company, Milwaukee, Wis.

Methods of Compensating Production Executives. Policyholders' Service Bureau, Metropolitan Life Insurance Company, New York.

Specifications and Formulae for Non-Ferrous Metals. S. A. E. specifications reprinted by permission of the Society by the Niagara Falls Smelting and Refining Corporation, Buffalo, N. Y.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39th STREET, NEW YORK.

The Winter meeting of the Institute of Metals Division will be held in New York, at 29 W. 39th street, February 15-17, 1927, inclusive. The program follows.

ZINC SESSION

Tuesday, Feb. 15, 2 p. m.—George C. Stone, Chairman

"Preparation of Metallic Single Crystals with Especial Reference to Single Crystals of Zinc," by O. E. Romig.

"Plastic Deformation of a Zinc Crystal." by Dr. Samuel L. Hoyt.

"Plastic Deformation of Coarse Grained Zinc," by C. H. Mathewson and A. Phillips.

"Solidus Line of Lead Antimony System," by E. E. Schumacher and F. C. Nix.

ANNUAL DINNER

The Institute of Metals Division will hold its annual dinner at the Fraternity Club, 22 E. 38th street, Tuesday, Feb. 15, at 6:30 p. m. J. A. Lingmaster, manager of the Technical Department for the New Jersey Zinc Company, will discuss informally present conditions in the zinc industry.

COPPER SESSION

Wednesday, Feb. 16, 9:30 a.m.—W. B. Price, Chairman

Note on the Distribution of Energy in Worked Metals and the Effect of Process Annealing Temperature on Fine Copper Wire.—Lyall Zickrick and R. S. Dean.

Relation of Annealing Temperature to Conductivity of Copper Wire.—J. C. Bradley.

Beryllium-copper Alloys.—William H. Bassett.

Comparative Properties of Tough Pitch and Phosphorized Copper.—W. R. Webster, J. L. Christie and Royden S. Pratt.

Study of 470° C. Transition Point in Cast 60:40 Brass.—Frances Hurd Clark.

Study of Heat Treatment, Microstructure and Hardness of 60:40 Brass.—Frances Hurd Clark.

ALUMINUM SESSION

Wednesday Feb. 16, 2 p. m.—Zay Jeffries, Chairman

Corrosion and Physical Properties of Some Alloys of Aluminum, Zinc and Tin.—N. O. Taylor.

Equilibrium Relations in Aluminum-manganese Alloys of High Purity.—E. H. Dix and W. D. Keith.

Deformation of an Aluminum Alloy by Constant Load.—C. B. Sadtler and J. L. Gregg.

Still Casting of Metals.—P. H. G. Durville.

ANNUAL LECTURE

Wednesday, Feb. 16, 4 p. m.—S. A. Taylor, Presiding

The Growth of Metallic Crystals.—Prof. Cecil H. Desch, Sheffield University.

The hour for delivery of this lecture is selected in order that all members may have an opportunity to attend this session of the Institute of Metals Division.

GENERAL SESSION

Thursday, Feb. 17, 9:30 a. m.—Alfred E. White, Chairman

Plastic Deformation of Metals.—J. T. Norton and B. E. Warren.

General Theory of Metallic Hardening.—R. S. Dean and J. L. Gregg.

Tungsten and Thoria.—Zay Jeffries and P. Tarasov.

Grain Boundary Phenomena in Filaments of Tungsten and a Few Other Metals of High Melting Point.—E. S. Davenport.

JOINT SESSION OF INSTITUTE OF METALS DIVISION AND NON-FERROUS METALLURGICAL COMMITTEES

Thursday, Feb. 17, 2 p. m.—Arthur L. Walker, Chairman

Acceleration of the Rate of Oxidation of Ferrous Iron in the Presence of Copper and its Application to the "Heap Leaching" Process.—E. Posnjak.

Copper Alloy Systems with Variable Alpha Range, and Their Use in the Hardening of Copper.—M. J. Corson, and Notes on the Atomic Behavior of Hardenable Copper Alloys.—E. C. Bain.

The Tarnish Resistance and Some Physical Properties of Silver Alloys.—Louis Jordan, L. H. Grenell and H. K. Herschman.

The Application of Microtome Methods to the Preparation of Soft Metals for Microscopic Examination.—F. F. Lucas.

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 S. DEARBORN STREET, CHICAGO, ILL.

When at the Directors' meeting held in Detroit, September 26, it was decided to return to the practice of holding spring conventions, holding the next annual meeting, without an exhibit, in the spring of 1927, the question of location was referred to the Committee on Convention and Exhibits to investigate and report to the Directors at the annual Board meeting.

It was generally accepted that the 1928 convention with an exhibit would be held in the East, and for that reason it was decided not to consider eastern cities for 1927.

Following a full discussion, the Board voted unanimously to meet in Chicago June 6, 7, 8 and 9, and authorized a sub-committee on Conventions and Exhibits to select headquarters and make necessary arrangements.

Following several conferences this committee decided unimously in favor of Edgewater Beach Hotel.

The tentative schedule of meetings presents the following line-up:

Monday, June 6—Registration and Committee Meetings.

Tuesday, June 7—Sessions on Apprentice Training, General Foundry Practice, and Gating Castings.

Wednesday, June 8—Sessions on Non-ferrous Founding, Cast Iron Metallurgy, Steel Founding and Malleable Iron.

Thursday, June 9—Sessions on Foundry Costs and Sand Control.

Breakfast gatherings each morning to promote acquaintanceship will be arranged for Non-Ferrous, Gray Iron, Steel and Malleable Groups. It is hoped to make this a real feature of this meeting. Many a member will testify that through a chance meeting with another member at a convention he has learned of some practice or method that applied to his business which has resulted in great saving or better products. Watch the program, join your group and enjoy the benefits.

BRASS MANUFACTURERS

HEADQUARTERS, CITY HALL SQUARE BLDG., CHICAGO, ILL.

Wm. M. Webster, Commissioner, has been served with notice from the Street & Kent Manufacturing Company that the use of the word "Rainbow" shown under Double Lavatory and Shampoo Faucet No. 6315, page 41 of the new Official Catalog, is an infringement upon their trademark, which is Patent Office No. 110,906, of date June 13, 1916, and they further state they have used the name "Rainbow" since the trademark patent was issued in various trade papers, booklets, pamphlets, catalogs and other forms of advertising matter, and that the use by the Association of same, abridges their rights.

Mr. Webster has reviewed certain papers, letters and other documents they have presented in the case, and knowing it is not the wish of this Association or its members to take undue advantage of the rights of anyone or to court unnecessary litigation, and for their purpose the use of the name "Rainbow" appears to them to be of such little advantage or significance that he feels they should not invite involvement or litigation. He therefore advised them he would advise the members of the National Association of Brass Manufacturers to discontinue its use and give due notice of this in the trade journals.

BRITISH INSTITUTE OF METALS

HEADQUARTERS, 36 VICTORIA STREET, LONDON, S. W., ENGLAND

The following communications will be presented at the Annual General Meeting, March 9-10, 1927:

415. HONDA, Professor Kôtarô, and Professor HIKOZO ENDO.
"Magnetic Analysis as a Means of Studying the Structure of Non-Magnetic Alloys."

416. BLAZEY, Clement.
"Brittleness in Arsenical Copper."

417. GROGAN, J. D.
"The Influence of Calcium on Aluminium Containing Silicon."
With an Appendix on "The Estimation of Calcium in Aluminium Alloys, by P. G. WARD.

418. HANSON, Professor D., and GRACE W. FORD.
"Investigation of the Effects of Impurities on Copper." Part V.—The Effect of Bismuth on Copper."

419. HANSON, Professor D., and C. B. MARRYAT.
"Investigation of the Effects of Impurities on Copper. Part III.—The Effect of Arsenic on Copper. Part IV. —The Effect of Arsenic plus Oxygen on Copper."

420. FRIEND, J. Newton, and W. E. THORNEYCROFT.
"Examination of a Fifteenth Century Brass."

421. HARGREAVES, F.
"The Application of Strain Methods to the Investigation of the Structure of Eutectic Alloys."

422. HARGREAVES, F.
"Note on the Crystallization of the Lead-Tin Eulectic."

423. GENDERS, R.
"The Mechanism of Inverse Segregation in Alloys." With an Appendix on "The Accurate Determination of Copper in Bronze by Electrolysis," by R. A. F. HAMMOND, B.Sc., A.R.C.Sc., A.I.C.

424. MOORE, H., and S. BECKINSALE.
"Notes on the Manufacture and Properties of Hair Springs."

425. MILLER, J. H.
"The Penetration of Brass by Tin and Solder, with a Few Notes on the Copper-Tin Equilibrium Diagram."

426. FRIEND, J. Newton., and W. E. THORNEYCROFT.
"Note on the Silver Contents of Roman Lead from Folkestone and Richboro Castle."

427. CAMPBELL, D. F.
"Electric Furnaces in Non-Ferrous Metallurgy."

428. HANSEN, M.
"The Magnesium-Rich Magnesium-Copper Alloys."

429. HOLMAN, Professor Bernard W.
"An Etching Reagent for Copper."

430. GENDERS, M. B. E.
"The Penetration of Mild Steel by Brazing Solder and Other Metals."

431. HARTLEY, Harold J.
"The Attack of Molten Metals on Certain Non-Ferrous Metals and Alloys."

TESTING MATERIALS SOCIETY

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

The year 1926 was an eventful one for the American Society for Testing Materials. Its technical activities have gone forward with as rapid a pace and have been as productive as at any time in the Society's history. Much of this has been due to its committees for they are the life of the Society. Of these committees there are now forty-five. A number have found it necessary to increase their membership in view of the divers subjects now receiving their attention, the membership of the committees now totaling 2,100. An idea of the virility and activity of these committees may be gained from the reports presented at the annual meeting, reports having been receivd from thirty-six of the committees.

While the standardization work has not been neglected in any respect, as may be seen from the fact that fifty-four new standards were submitted as tentative, making the present total of standards and tentative standards 447, greater attention has been paid than at any time hereofore to the promotion of research. Many of the committees have carried on extensive rsearch investigations either in the form of correlative and co-operative tests to settle some meature of its standardization work or as pure investigational work. In addition, a wealth of material has been brought out in the technical papers read at the meeting.

The many reports and papers presented at the annual meeting will be issued, as usual, together with the discussions thereon, in the form of annual Proceedings. These comprise close to 1,900 pages, the second largest in the Society's history. Those standards adopted by action of the annual meeting were issued in the form of a supplement to the 1924 Book of A.S.T.M. Standards, comprising a pamphlet of somwhat over 100 pages. In addition, for the convenience of those desiring them in that form, all of the Tentative Standards were issued collectively in the 1926 Book of A.S.T.M. Tentative Standards, a volume of 1,100 pages.

The number of new numbers during the year was greater than ever before, totalling 537. The net increase in membership was 271, making the membership as of December 31, 4,135.

AMERICAN ELECTRO-PLATERS' SOCIETY

CHICAGO BRANCH

HEADQUARTERS, CARE OF ROBERT MEYERS, 2432 WILSON AVE.

One of the most successful educational meetings held by the Chicago Branch of the American Electro-Platers' Society took place Saturday afternoon, January 29, 1927, in the foyer of the Grand Ball Room of the New Palmer House, Monroe street and Wabash avenue, Chicago. This was the fifteenth annual banquet held by the branch.

At 2 P. M. the meeting, with O. E. Servis acting as chairman, was called to order.

The first speaker introduced was Cleveland Nixon of the Western Clock Company of La Salle, Ill., who gave a very interesting talk on the Effect of Concentration on Nickel Deposits. Second on the program was a paper written by Dr. O. P. Watts of the University of Wisconsin on Throwing Power of Plating Solutions. Dr. Watts was confined to his home by illness and unable to be present at the meeting.

H. A. Gilbertson, of Gilbertson and Son, Chicago, Ill., was the next speaker called and his subject, which was very interesting, was Corrosion of Silver Deposits. The fourth speaker was F. R. Porter, of the Edison Appliance Company, Chicago. Mr. Porter talked on the important subject of chromium plating, the title of his paper being Notes on Chromium Plating.

The last speaker of the session was "Cap" Taylor, of A. P. Munning and Company, Chicago, who spoke on the subject of Plating Room Control.

Following each speaker general discussions took place and questions and problems were discussed with much interest.

At 7 P. M. dinner was served in the Red Lacquer Room. More than two hundred reservations were made. During the dinner, the guests were entertained by a varied and interesting program of unusual talent. Following the dinner, the remainder of the evening was spent in dancing.

NEWARK BRANCH

HEADQUARTERS, CARE OF ROYAL CLARK, P. O. BOX 201

On Friday evening, January 21, 1927, the Newark Branch of the American Electro-Platers' Society held an open meeting in the new meeting room of Franklin Hall. A large delegation from New York Branch brought the attendance up to 58. The routine business was quickly put through and the first speaker of the evening, L. Graham, gave a most interesting and instructive lecture on "Hydrogen Ions." Mr. Graham's method of explanation on the blackboard, on the intensity of acid in various acids used in the electro-deposition of metals was such that all those present had a much better understanding of Hydrogen Ions at the end of the lecture.

A. P. Munning addressed the meeting, enumerating the strides made in the electro-plating art within the space of the past few years. George B. Hogaboom was scheduled to address the meeting, but when the time arrived to speak, his voice failed him, due to hoarseness. A vote of thanks was given the speakers.

Messrs. MacStoker, president of New York Branch; Fisher, past-president New York Branch; Sterling, secretary New York Branch, and Liguri, responded with a few words of appreciation of the open meeting.

At 10:30 P. M. adjournment was in order and all present partook of refreshments.

INTERNATIONAL FELLOWSHIP CLUB

HEADQUARTERS, CARE OF R. J. HAZUCHA, 1115 WASHINGTON BOULEVARD, CHICAGO, ILL.

The meeting of the International Fellowship Club was held at 12:00 o'clock luncheon, Saturday, January 29, 1927, at the Palmer House, Monroe and Wabash Ave., Chicago, Ill.

This body of representatives have been meeting since 1924 in Montreal, New York and Newark, with the results that the membership has been more than trebled since the first meeting.

There are no dues connected with this organization and all representatives calling on the electro-plating and finishing trade are eligible. If those interested will notify the Secretary at 1115 Washington Blvd., he will make necessary arrangements for their convenience.

The functions of the International Fellowship Club as yet have not been determined, but below is a suggested Code of Ethics. This suggested Code of Ethics will come up for discussion at the next meeting.

Believing that the complications in selling, due to difference in custom, character, and knowledge, can be overcome to a considerable degree if those selling to the same trade will publicly acknowledge and live up to a basic system of principles,—

The International Fellowship Club has adopted this Code of Ethics as a guide to those who are engaged in selling to the Electro-plating Industry and do hereby pledge themselves:—

1. To be guided by the laws of honor and to compete with fairness and honesty.
2. To refrain from false references to competitors and their products ar the circulation of harmful rumors concerning them.
3. To strive for a better knowledge of materials and processes so as to more efficiently advise the industry.
4. To promote the welfare of the industry.
5. To remember that information gained in the line of business is privileged and not to be revealed except with full consent.
6. To assure the buyer full co-operation and the use of as limited amount of his time as the subject at issue will permit.
7. To co-operate in every way with those engaged in activities which will aid and improve the industry and to work with our competitors in all lawful ways to increase the efficiency and service to the industry as a whole.
8. To support actively the Federal Trade Commission in locating and prosecuting individuals guilty of improper practices.
9. To respect all obligations and to require that obligations to us and our companies be respected.
10. To adhere faithfully to the rules of conduct herein set forth, recognizing that a simple guide to right action is found in the practice of the Golden Rule.

ARTISTIC LIGHTING EQUIPMENT

HEADQUARTERS, 424 GUARANTEE TITLE BLDG., CLEVELAND, OHIO

Cleveland, Ohio, which ranks second as a manufacturing center of lighting equipment, has been selected as the place for the National Lighting Equipment Exhibition, which is the Annual Show of the Artistic Lighting Equipment Association, a national organization of manufacturers of lighting equipment, parts and supplies.

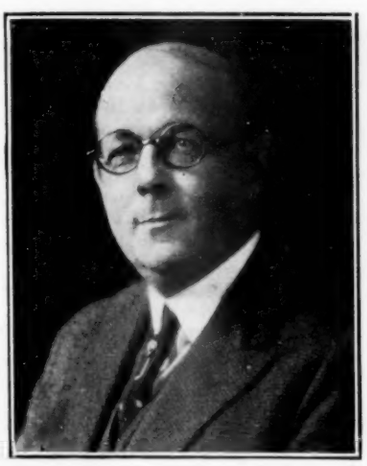
The entire Hollenden Hotel, as well as part of the new section now under construction, will house the exhibits. Here, during the week of January 31st to February 5th, 1927, came between seven and eight thousand manufacturers, dealers, jobbers, architects, builders and electrical contractors to see under one roof all that is best in modern, well-designed lighting equipment for the home, factory or public building.

Not only were the products of American industries shown but many examples of the work of foreign manufacturers.

Personals

WILLIAM M. RULE

An appointment of much interest in industrial circles, and especially to the brass industry, is that of William M. Rule as General Manager of The Michigan Copper and Brass Company, Detroit, Mich., succeeding the late A. B. Seelig, who was General Manager from 1919 until his decease a few months ago.



WILLIAM M. RULE

Mr. Rule, who for the past seven years has been associated with the Michigan mill, came to Detroit from Waterbury, Conn. His experience in the brass business dates back to 1896, when he entered the employ of Holmes, Booth & Hayden, Waterbury. Later he was transferred from this Company to the Coe Brass Company, Torrington, Conn. Following this, and at the time when the various mills united to form the American Brass Company, Mr. Rule was selected to fill the position of Auditor of Operations, which gave him a wide field for comparative study of the operations and the methods employed by them in procuring their record of costs.

Mr. Rule became associated with the Michigan Copper & Brass Company as Treasurer, in 1919, about a month after the appointment of the late A. B. Seelig as General Manager of the Company. Through the united efforts of Mr. Seelig, Mr. Rule and Mr. William Westerman, Manufacturing Manager, and the efficient organization which they built around them, the Michigan mill has come to occupy a place of prominence in the industry.

Clifford C. Buckingham of Chicago, Ill., has joined the sales organization of the General Abrasive Company, Niagara Falls, N. Y. He will travel through the states of Ohio, Michigan, Indiana and Illinois as salesman and demonstrator of the company's abrasive grains and other products.

Raymond H. Liefeld is the latest man to join the ranks of the Bridgeport Brass Company's flush valve crew, in Bridgeport, Conn. His experience in field work for large companies, investigating sales possibilities of various markets, has been a good preparation for his work.

George M. Bakewell, formerly overseas representative for the Champion Spark Plug Company, is the new head of the export department of the Bunting Brass & Bronze Company, Toledo, Ohio. Mr. Bakewell will make his headquarters at the export offices of the company, 254 West 54th street, New York.

J. Barton Harry has resigned as vice-president of the Edwin Burhorn Company, New York, to organize the J. Barton Harry Company, 635 North 64th street, Philadelphia, Pa., manufacturers of water towers and also direct representatives for the Clearfield Machine Company, manufacturers of brass and iron castings.

James Warren is now works manager of the Rome Manufacturing Company, Rome, N. Y., having resigned as manufacturing executive of the Lalance & Grosjean Manufacturing Company, Woodhaven, N. Y. Prior to his association with the Lalance & Grosjean organization he was works manager for the Superior Steel Corporation.

Ralph W. Harbison, president of the Pittsburgh Lacquer and Chemical Company, Pittsburgh, Pa., accompanied by Mrs. Harbison and his son Fred, sailed from New York on the Majestic January 28th, for a trip which will take him to **Paris, St. Moritz, Venice, Triste, Naples, Rome, Florence**, Pisa, Geneva, Nice and Cairo, Egypt.

Prof. Colin G. Fink, Columbia University, New York, delivered a lecture on Recent Developments in Electrometallurgy before the New York Section of the Institute of Mining and Metallurgical Engineers on January 20, 1927. Of particular interest were his remarks on the chromium plating of steel and the restoration of ancient bronzes by electrolysis.

D. E. Anderson has been made sales engineer for the Bohn Aluminum & Brass Corporation, Detroit, Mich. Mr. Anderson has been in the automotive industry for 22 years, having served with Cadillac Company, Hudson and Essex and the Sunnyhome Electric Company. In his new work he will assist A. L. Nelson in sales work on the Nelson Bohnalite piston and will also promote other Bohn products.

Dr. Robert J. Anderson, president of Robert J. Anderson, Inc., chemists, metallurgists and consulting engineers, Cincinnati, Ohio, addressed the Cincinnati chapter of the American Society for Steel Treating at the Engineer's Club, on January 7, 1927. The topic was "The Production, Heat Treatment and Uses of Aluminum-Alloy Castings." The subject was discussed in a general way, and more particularly as regards present practice and recent developments of importance. The lecture was illustrated with about 100 photographic slides.

George A. Russ has joined the service staff of the Quigley Furnace Specialties Company, Inc., of New York, manufacturers of hytempite, Quigley refractory gun, Triple-A solutions, etc. He will cover the Central South and South Atlantic States. Mr. Russ has been for years identified with the manufacturing and sales departments of large industrials in the territory he now covers for the Quigley Company and enjoys a wide personal acquaintance throughout the field. Making his headquarters at Atlanta, he will co-operate with all Quigley agents throughout the South.

Obituaries

JOHN W. MANN

John W. Mann, Service Engineer of the Chicago Crucible Company, Chicago, Illinois, manufacturers of crucibles and refractories, died at his home in Antioch, Illinois, on January 1st.

Mr. Mann was born in Warren County, Pennsylvania, sixty-five years ago, and has been closely identified with the foundry industry since early manhood, having started his work in connection therewith as a molder's apprentice, progressing to positions of trust, not only with his employers but with the men under him. This confidence, in time, elected him to the office of President of his Union, in which capacity he served for many years. Later he entered into business for himself, until 1917, when he joined the forces of the Chicago Crucible Company, which he served until the time of his death.

Mr. Mann was well known throughout the industry and his friends point with considerable pride to his many accomplishments, not only from a practical side of the foundry business but the humanitarian side as well.

EDWARD LEITELT

Edward Leitelt, vice-president and treasurer of the corporation of Leitelt Brothers, brass and aluminum founders, Chicago, Ill., was born in the city of Grand Rapids, Mich., on the 4th of July, 1875, and there he received his early education by attending the public schools. This was later supplemented by a special course in electrical engineering, at Chicago's famous school of technology, Armour Institute. Mr. Leitelt came to Chicago in 1898 and for the following six years was in the employ of the Commonwealth Edison Company. Thereafter he was operating engineer in a Chicago factory until 1908, when he became associated with his brother Charles in founding the business of Leitelt Brothers. Mr. Leitelt was affiliated with the Knights of Columbus.

ARTHUR WILLIAMS PEARCE

Arthur Williams Pearce, treasurer of the Williams-Harvey Corporation, 111 Broadway, New York, tin smelters, died recently at his residence, 277 Park avenue, after a ten days' illness of pleural pneumonia with complications. He is survived by his wife, who was Lucy Inman, and three sons. Mr. Pearce had been with the Williams-Harvey Corporation since its organization in 1917. He was a son of Richard Pearce, a pioneer in the tin smelting industry in this country. He was graduated from Yale in 1896 and was a member of the Delta Psi fraternity. His clubs included the Racquet and Tennis, St. Anthony and Rockaway.

DE COURCEY CLEVELAND

De Courcey Cleveland, aged 50, president of the Medina Iron & Brass Company, died at the Medina Memorial Hospital, Medina, N. Y., January 25, 1927. He is survived by his widow, Katherine Shaw Cleveland.

Mr. Cleveland was born at Short Hills, N. J., in 1876, was educated in New York City, leaving school for business at the time he was prepared for Columbia University. He came to Medina to remain in September, 1919.

Mr. Cleveland's father was Delancey Cleveland, an importer of New York City.

LAWRENCE G. GEIS

Lawrence G. Geis, 49 years old, treasurer and auditor of the F. H. Langsenkamp Company of Indianapolis, manufacturers of brass machinery and devices, died recently at a hospital after an illness of five weeks. He was a member of the Elks lodge, the Indianapolis Chamber of Commerce and had spent most of his life in Indianapolis. He leaves a widow and two sisters.—E. B.

JAMES RICH

James Rich, owner of the Peekskill Nickel Plate Works, of which he was one of the four organizers twenty-five years ago, died January 28, 1927, at his home in Peekskill, N. Y., aged 60.

WILLIAM J. WOLF

William J. Wolf, treasurer of the Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., died recently after an operation for appendicitis. Mr. Wolf was 38 years old.

STANLEY CLAGUE

Stanley Clague, managing director of the Audit Bureau of Circulations, of which THE METAL INDUSTRY is a member, died recently at Henrotin Hospital in Chicago, after a prolonged period of ill health. He leaves a widow, two sons and two daughters. He was one of the best known figures in the publishing business in the United States.

Mr. Clague, who was 55 years old, was born in the Isle of Man. He came to the United States at the age of 20. His first position was as secretary to the late Dr. Charles W. Eliot, then president of Harvard University.

For several years he was head of the advertising service department of the Curtis Publishing Company in Philadelphia. Leaving that position in 1908, he came to Chicago and organized his own advertising agency.

From the time of the organization of the "A. B. C." until his election as managing director, Mr. Clague was a member of the board of directors.

STANLEY CLAGUE

Mr. Clague was formerly president of the Affiliated Agents' Association of America and he served as the first president of the Western Advertising Association. In a report to the annual convention of the Audit Bureau of Circulations in Chicago in 1924, Mr. Clague said that the work of the Bureau saved money for the ultimate consumer, for, by advertising only in media having guaranteed circulation, the advertiser eliminated wasteful expenditure.

NEWS OF THE INDUSTRY

MOTOR BOAT SHOW

The annual Motor Boat Show was held at Grand Central Palace, New York, January 24-29, 1927. A complete line of motor driven boats and yachts was shown and in addition a large number of manufacturers of accessories and parts were exhibited. These accessory manufacturers included a number of large users and manufacturers of metals and metal products, among whom were the following:

American **Bosch Magneto Corporation,** Springfield, Mass. Magnetos and windshield wipers.

American **Machine and Foundry Company,** Brooklyn, N. Y. Rotary pumps.

Bosworth Filter Company, Inc., Long Island City, N. Y. Bronze filters.

Bethlehem Spark Plug Company, Bethlehem, Pa. Spark plugs.

Columbian **Bronze Corporation,** Freeport, L. I. Propellers, struts, etc.

Delco-Light Company, Dayton, Ohio. Lighting systems and refrigerators.

E. G. Long Company, New York. Bronze pumps.

Eisemann Magneto Corporation, New York. Magnetos.

Electric **Storage Battery Company,** Philadelphia, Pa. Storage batteries.

Evinrude Motor Company, Milwaukee, Wis. Outboard motors.

Hyde Windlass Company, Bath, Maine. Propellers, tillers, stuffing boxes, stern bearings, struts, etc.

International Nickel Company, New York. Nickel and Monel metal.

Ireland and Mathews Manufacturing Company, Detroit, Mich. "Autopulse," an electrical gasoline feed device.

Kelvin and Wilfrid O. White Company, New York. Nautical instruments.

Lockwood Motor Company, Jackson, Mich. Outboard motors.

Light Manufacturing and Foundry Company, Pottstown, Pa. Marine reverse gear.

Moto-Meter Company, Inc., Long Island City, N. Y. Motometers and industrial thermometers.

M. L. Oberdorfer Brass Company, Syracuse, N. Y. Bronze gear pumps.

National Marine Lamp Company, Forestville, Conn. Searchlights.

New York Johnson Motor Company, New York, Outboard motors.

Portable Light Company, Inc., New York. Searchlights.

Pyrene Manufacturing Company, Newark, N. J. Fire extinguishers and contract metal finishing work.

Robert Bosch Magneto Company, Inc., New York. Magnetos.

Schebler Carburetor Company, Inc., New York. Carburetors.

Sperry Gyroscope Company, Brooklyn, N. Y. Searchlights, gyro-compass, gyro-ship stabilizer, gyro-pilot, rudder indicator, etc.

The Rajah Company, Bloomfield, N. J. Snap terminals.

U. G. Lee and Company, Chicago, Ill. Plumbing fixtures.

Walter Kidde and Company, Inc., New York. Fire extinguishers.

Waterbury Clock Company, Waterbury, Conn. Ship's clocks.

Wilcox, Crittenden & Company, Inc., Middletown, Conn. Marine fittings.

One of the outstanding features of the show was the original motor boat Cigarette IV designed by Frederick K. Lord. This motor boat, one of the fastest in existence, is made entirely of metal, the hull being of sheet Duralumin and the propeller of manganese bronze.

INTERNATIONAL CHEMICAL CONFERENCE

On January 2 and 3, 1927, all the sales engineers of the International Chemical Company from throughout the middle west gathered in Chicago for a regular semi-annual conference. This conference, like all others, was to a large extent merely a clearing house of technical information. The first day was spent entirely on the discussion of technical aspects of industrial cleaning and quite a time was spent on the use of the new International Compounds No. 368-C. Discussion on this item was led by L. H. E. Armour and H. J. Butler. R. W. Armour led the discussion on the many special problems encountered in plants throughout the middle west. C. W. Morris gave a very interesting talk on lacquering.

The second day was spent entirely on the manipulation of water soluble, drawing, stamping, and cutting compounds and on the newly developed Soluble Oil. Discussion on this was led by D. J. Benoliel and H. E. Armour, Jr

AMERICAN BRASS TO MAKE EVERDUR

The American Brass Company, Waterbury, Conn., announced during January, that arrangements have been completed whereby it will take over the manufacture and sale of Everdur Metal from the Du Pont Everdur Company, Wilmington, Del.

Everdur is a trademarked and patented alloy of copper, silicon and manganese. It was developed by the Du Pont Company in their search for a metal that would combine the tensile strength and elastic limit of low and medium carbon steels with good machining and working qualities and high resistance to a large number of corroding agents.

This alloy is manufactured by the American Brass Company in the form of casting ingots, plates, sheets, rods and wire, and is also available in the form of washers, bolts, nuts, screws, rivets, wire cloth and castings.

The research work conducted by the Du Pont Everdur Company will be continued by the American Brass Company.

ALUMINUM SCRAP RECOVERY

The sale of rights to use a new process for the recovery of scrap aluminum was made January 10, 1927, by Dr. Robert J. Anderson, to Aluminum Industries, Inc., Cincinnati, Ohio, producers of secondary aluminum and aluminum alloys. The new process has special application in the recovery of aluminum from low-grade scraps.

HOBART BUYS CRESCENT COMPANY

Following its recent purchase of the plant and business of the Crescent Washing Machine Company, New Rochelle, N. Y., the Hobart Manufacturing Company, Troy, Ohio, manufacturer of food choppers, cutters, etc., has arranged for a stock issue to total $1,879,900, the proceeds to be used in part to carry out the merger and for proposed expansion. A. G. Stouder is president.

LARGE MERCURY SHIPMENT

Tacoma, Washington, became the connecting link between the International Market at New York and the mercury mines at Morton (61 miles from Tacoma) as the point believed destined to become one of the mercury centers of the world, by loading there.

LARGE MERCURY SHIPMENT

the first shipment of the elusive liquid metal to the Atlantic Coast.

On Saturday, January 15th, a shipment of seventy iron flasks, each containing seventy-five pounds of mercury, was received at the Port piers and was loaded on the Willfare of the Williams Line for New York.

The mercury in each flask is worth $96.90, making the value of the entire shipment worth $6,783 or $1.27 per pound.

Although this is the first shipment from the Morton mines it is expected to be the beginning of a continuous mercury traffic.

BIG BELL ARRIVES

The Olympic, sailing from England to the United States had to decline a heavy "passenger," the 17½-ton bell destined to top Wanamaker's store building in Philadelphia, Pa. The bell was later shipped on the Cunard Liner Ascania.

It is said that the bell will be the largest in the United States. Montreal Cathedral has a bell weighing 14 7-25 tons. The great bell of Moscow weighs 216 tons.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

FEBRUARY 1, 1927.

While no price has been mentioned in connection with the purchase of the assets and good-will of the **U. T. Hungerford Brass & Copper Company** by the **Chase Companies, Inc.,** it is considered that the fact that the local concern increased its capital stock from $10,000,000 to $12,000,000 following the announcement of the purchase gives an indication of the price as the local concern states that the increase was for the purpose of financing the project.

The chief features of the purchase are that the Hungerford warehouses all over the country will be added to the present Chase warehouses and that the Hungerford organization will now distribute only Chase brass whereas heretofore it has distributed other makes as well, particularly, **Anaconda-American Brass** products. The Hungerford warehouses are in Cleveland, Philadelphia, Baltimore, Boston, New York, St. Louis, Pittsburgh and San Francisco. The local concern already has warehouses in New York, Newark, Boston, Cleveland, San Francisco and Los Angeles.

Honor to **Charles F. Brooker,** late **American Brass** chairman, continues to be paid after his death. **Yale University,** the recipient of $50,000 in his will, through its directors, passed resolutions on his death. The local Rotary Club devoted one of its meetings last month to honoring his memory, guests being present from all the manufacturing concerns of the Naugatuck valley and the eulogy being delivered by President **John A. Coe** of the **American Brass Company.** Resolutions on his death were passed by the **North American Civic League for Immigrants,** which he aided.

Shipment of brass and brass products constituted the second largest item of exports from Connecticut during the last quarter of last year, according to figures from Washington.

Dividends of more than $6,000,000 were paid by local concerns during 1926 according to figures of a local brokerage concern. **Scovill Manufacturing Company** heads the list with payment to stockholders of $2,655,000.

In spite of the troubled conditions in China, **F. S. Chase,** president of the **Chase Companies, Inc.,** with Mrs. Chase and daughters, plan to make an extended trip next month to visit his son, **A. Sabin Chase,** vice consul at Pekin.

Many Waterbury manufacturers figure in the elections of local banks last month. **E. O. Goss,** president of the Scovill Company, was elected president of the Citizens & Manufacturers Bank; **John H. Goss,** vice-president of the company was elected vice-president of the Morris Plan Bank; **Irving H. Chase,** president of the Waterbury Clock Company, was elected president of the Waterbury National Bank; **F. S. Chase,** president of the Chase Companies, was elected a director of the Citizens & Manufacturers Bank; **Benjamin L. Coe,** of the Steele & Johnson Company, was elected president of the West Side Savings Bank and fourth vice-president of the Citizens & Manufacturers Bank; **John P. Elton,** of Blake & Johnson's, was elected president of the Dime Savings Bank and vice-president of the Morris Plan Bank.

John A. Coe, president of the American Brass Company, has been elected a director of the Anaconda Copper Mining Company, succeeding the late **Charles F. Brooker** in that position. **Clarke S. Judd,** vice-president of the Kenosha branch of the American Brass Company, has been elected a director of the American Brass Company, to fill the place made vacant by the death of Mr. Brooker. Mr. Brooker's successor as chairman of the board will be elected at this month's meeting of the American Brass Company.

The American Brass Company is a creditor to the amount of $6,852; Blake & Johnson to the amount of $2,900; Plume & Atwood Company to the amount of $600 in the bankruptcy proceedings now being brought against the **Simpler Spinning & Stamping Company** of New York.

The **Eagle Lock Company** of Terryville has declared an extra dividend of 50 cents a share in addition to its regular quarterly dividend of 75 cents. This makes a total dividend payment for the last year of 18 per cent compared to 17½ per cent for 1925.—W. R. B.

BRIDGEPORT, CONN.

FEBRUARY 1, 1927.

An optimistic forecast for business during the present year has been made by **George S. Hawley,** president of the Manufacturers Association. He discredits the idea of the so-called business cycles and consequently the idea that because of the exceptional business last year that this year must show a slackening. Production in the city is going ahead more efficiently and rapidly than ever and at the same time consumption is growing greater, he said.

William L. Belknap of the **Belknap Manufacturing Company** at the meeting of the Kiwanis Club last week predicted a year of prosperity due to the fact that there is no surplus stock on hand, money conditions are good, no crop failure, no radical legislation in sight and the building program calls for increased operations.

Bridgeport's payroll struck a new peak last year according to the First National Bank, the total for the year being $54,422,748 compared to $51,771,408 for 1925 and about $48,000,000 for 1924.

Cutlery, ammunition, methods of manufacture and of selling and new sales policies were discussed at the three days' conference here last month of the factory and sales executives of the **Remington Arms Company.** Additional lines of products will be brought out this year it was said.

Directors of the **Bullard Machine Tool Company** last month voted an extra dividend of 50 cents a share on the 92,000 shares of common stock. It was stated that the annual report now in preparation will show record earnings.

A claim of the United States for additional income tax from the bankrupt **Bridgeport Iron & Metal Company** was dismissed in a decision handed down by Referee in Bankruptcy John Keogh last month. The government sought to collect $8,994 from the concern which went into bankruptcy in 1924 with assets of $325,800 and liabilities of $681,200.

A three days' conference of the executive force and sales managers of the **Dictaphone Corporation** was held here last month. The principal speaker was **C. K. Woodbridge,** president of the company.

The trustees of the shares left by **Henry R. Towne,** late president of the **Yale & Towne Manufacturing Company** of Stamford, have applied to the Supreme Court for permission to sell 3,400 shares and use the proceeds to erect a building at a cost of $283,200 on property owned by the company for welfare and educational work among the employes. The company will pay the taxes and contribute $40,000 a year towards the maintenance from the unused portions of the fund. Mr. Towne left 6,000 shares, having a total value of about $500,000, for a building for welfare and educational work among his employees.—W. R. B.

TORRINGTON, CONN.

FEBRUARY 1, 1927.

John A. Coe, president of the **American Brass Company,** gave a memorial address on the late **Charles F. Brooker** at the Torrington Club, Monday evening, January 24. He outlined Mr. Brooker's career and paid a fine tribute to him as a man, a leader and a philanthropist.

Building operations are still in progress at the Torrington plant of the **American Brass Company,** some of the older buildings being enlarged and new construction being undertaken.

There was a slight let-up in business here immediately following January 1, a number of workers being laid off and working schedules being curtailed in several of the shops. This condition is expected to be only temporary, however, and already there are signs of things picking up again.

Charles E. Bennett of the American Brass plant has been elected chairman of the committee appointed to consider proposed amendments to Torrington's city charter.

A new industry—the **Harriman Power Plant Corporation**—has started operations in Torrington, occupying the Kirsch building recently erected. Its product is a new type of oil engine.

George H. Atkins, secretary of the employers' association and for over half a century connected with the **Turner & Seymour Manufacturing Company,** is ill at his home here, having been stricken with a nervous breakdown.—J. H. T.

NEW BRITAIN, CONN.

FEBRUARY 1, 1927.

Reports from bankers about the country that there is a marked decline in the building business has not yet been noticeably reflected in the hardware manufacturing firms in this city. The **Stanley Works,** it is true, has given a general wage reduction of 10 per cent and at several of the other local concerns cuts have been announced in various departments but there has been no curtailing of working hours nor has there been any great reduction in the personnel of the various concerns.

A survey of the situation in this city seems to indicate that while business is somewhat duller than it has been, there is no actual slump nor is there any indication that one is expected. In cases where orders do not keep production at near peak load the output is diverted into the stock rooms for the expected spring demand.—H. R. J.

PROVIDENCE, R. I.

FEBRUARY 1, 1927.

Following a year that, as a whole, proved fairly satisfactory in all lines of the metal trades, the opening month of the new year showed a slight slackening in the building and jewelry branches. This, however, is seasonable, and believed to be only of a temporary nature as there has never been so many and so extensive building operations under way or awaiting a beginning as at present, while the outlook for the jewelry industry is considered particularly promising. While these two great groups are active there is certain to be corresponding activity in the small tools, machinery and numerous correlative lines.

Geo. T. Reynolds & Son, Inc., a new corporation to deal in machinery and tools, has been granted a charter under the laws of Rhode Island and will take over and continue the business of George T. Reynolds & Son, 54 Friendship street, Providence. The incorporators are: Hilda S. Reynolds, Reginald R. Reynolds and Rodney G. Reynolds, all of Providence.

The annual meeting of the **Brown & Sharpe Mutual Relief Association** was held on January 18 in the employment office of the **Brown & Sharpe Manufacturing Company,** at which the following officers were elected for the year 1927: President, David Arnott; Vice President, J. W. Chappell; Treasurer, Sherman B. Moulton; Assistant Treasurer, Charles H. Diggle; Secretary, John Harrop. The association, which has completed its fortieth year, is conducted by the employes of the Brown & Sharpe Manufacturing Company, who have built up sick and death benefit funds from which has been paid a total of $326,023.97, of which $21,947 was disbursed during the year 1926. Organized in 1886, the association has grown rapidly and steadily, and is becoming stronger and better each year.

The regular meeting of Providence-Attleboro Branch of the American Electro-Platers Society was held January 13 at its rooms in Engineers' Hall, 44 Washington street, Providence, and was well attended. An interesting address was made by **E. M. Hayden,** of the **Stanley Chemical Company,** East Berlin, Conn., which was followed by a question box and general discussion. At the recent annual meeting negotiations were consummated whereby the local branch would become affiliated with the **Providence Engineering Society** and the plan is said to be working out satisfactorily. The move was made for the reason that it was felt that closer associations between the two organizations would be to mutual advantage.

Eagle Cornice Company, 312 Blackstone street, Providence, has the contract for the sheet metal work and roofing for two new buildings that are being erected at the plant of the **American Electrical Works,** at Phillipsdale in East Providence.

More than 125 members of the **New England Manufacturing Jewelers' and Silversmiths' Association** attended the third luncheon meeting held at the Providence-Biltmore Hotel, Providence, on Jan. 20, to learn what effect the newly perfected process of chromium plating would have on their industry. The speaker was **Edward A. Coady,** of the **Chromium Corporation of America,** of New York, who said that any kind of jewelry can be plated with chromium, giving a finish and appearance like that of platinum. He described chromium as a metal, one of the hardest known, rating at 9 on a score of hardness of 10 for the diamond. Its leading qualities were said to be resistance to high temperatures, and its non-oxidizing and non-tarnishing nature.

Atlas Sheet Metal Works, 830 Eddy street, has the contract for the roofing and sheet metal work for the buildings being erected at Brown University this city.

Jewelers' Enameling Company is the name of a new firm that has started in business at 36 Railroad street, Attleboro, to conduct a general enameling business on jewelry, novelties and emblems. The owners of the new concern are **L. Berberian** and **G. Gurn,** both of whom are well known in the trade in that city.

A new corporation to engage in the manufacture and distribution of lacquers has been granted a charter under the laws of Rhode Island under the name of the **Standard Lacquer Company,** to be located in East Providence, with a capital stock of $5,000. The incorporators are **Elmer E. Tufts, Jr., Gurney Edwards** and **John S. Dole,** all of Providence.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

FEBRUARY 1, 1927.

The opening month of the new year has failed to create anything optimistic so far as business conditions are concerned in the local field of activity. Although seasonal quietude is expected in January and for a period following the holidays, the dullness at this time is much more pronounced than in many years past.

Not a manufacturing plant in Rochester—unless it is the General Railway Signal Company—is operating at full time, and nearly all are not employing full forces. This is especially true among the machine shops about the city, and at this time several hundred metal polishers and brass and copper workers about town are out of employment and have been since Christmas week.

Inquiry today about the city revealed the fact orders are very slack in all the brass foundries, customers asking only for such materials as they actually require. In other words, hand-to-mouth ordering now prevails. This condition has not existed since 1923. Hopes are entertained that business will brace up between now and April 1st.

A few of the larger plants are maintaining considerable activity. The **Todd Protectograph Company** and the **Stromberg-Carlson Manufacturing Company** might be mentioned in that connection. The silver-plating industry is very quiet just now.

Owing to the fact that most of the larger manufacturing concerns are taking inventory this month, officials were not inclined to discuss the outlook for the next two months.—G. B. E.

NEWARK, N. J.

FEBRUARY 1, 1927.

Walter Rautenstrauch, president of the **Fred F. French Company,** engineers and builders, of New York, has been chosen president of the **Splitdorf-Bethlehem Electrical Company,** whose main office and plant is at 392 High street, Newark. He will fill the post recently vacated by **M. J. Bartlett,** which had been temporarily filled by **E. H. Schwab,** chairman of the board, a brother of **Charles M. Schwab,** chairman of the Bethlehem Steel Company, a director. Mr. Rautenstrauch has ended his duties with the French Company and has taken up his new duties with the Splitdorf concern. He is a member of the engineering faculty of Columbia University, a member of American Society of Mechanical Engineers, New York Academy of Science and other societies. Prior to his association with the French Company, he was vice president of the J. G. White Management Corporation.

Jacob L. Newman, of this city, has been named receiver for the **Griggs Hardware Company,** of Rahway, N. J. It is said that the company has assets of $23,000 and liabilities of $21,000.

Following concerns have been incorporated: **G. A. Kleissler Company,** Newark, metals, $100,000; **Lillian Manufacturing Company, Inc.,** Elizabeth, manufacture electric lighting fixtures, $25,000; **Paragon Electric Corporation,** manufacture electrical appliances, 1,250 shares, no par value.—C. A. L.

TRENTON, N. J.

FEBRUARY 1, 1927.

Some of the metal industry plants in this city are not operating on full time, but the officials are hopeful that business conditions will improve by early spring. The **Jordan L. Mott Company,** which has been running 54 hours a week, found it necessary because of the lack of orders to cut down to 38 hours. The company is now operating but five days a week. Some of the other concerns are running full time.

The **Kaplan Jewelry Company,** operating a chain of stores in various cities, is in financial trouble and William L. Dill, of Paterson, has been named equity receiver by the Federal Court. Two of the creditors joining in the bankruptcy petition against the jewelry company are the **Gothic Watch Company, Inc.,** and the **Brunner Watch Company.** The company claims assets of $500,000 with liabilities listed at $400,000.

The **Triple Arc Lamp Company,** manufacturers of motion picture lamps, has been incorporated here and will operate a factory shortly. The concern now has an assembly plant at 17 East State street, Trenton.

Federal Judge Bodine has signed an order discontinuing the injunction suit filed recently on behalf of General Motors Company and affiliated companies against Motor Vehicle Commissioner William L. Dill to enjoin him from enforcing a ban on headlight lamps made by the **Guide Motor Lamp Manufacturing Company.** Mr. Dill finally withdrew the ban.

Following concerns were incorporated here: **United Silver Novelty Corporation,** Jersey City, $50,000 capital; **Clinton Manufacturing Company,** Camden, manufacture brass valves, $50,000 capital; **South Jersey Chemical Company,** Vineland, $200,000. **Sandford & Reuter,** Woodbridge, hardware, $100,000. **Peerless Products Company,** chemicals, Jersey City, $50,000. **Sander Radio Company,** radio sets, West New York, $100,000. **J. and G. Brass Company,** New Brunswick, N. J., brass fixtures $200,000. **Transcontinental Coil Company,** Newark, manufacture coils for radios, Newark, 500 shares no par value.

The plant of **Aurele M. Gatti, Inc.,** manufacturers of watch jewels and fountain pen points, 1701 Liberty street, Trenton, N. J., was gutted by flames on January 24. The blaze started in the boiler room and destroyed a good portion of the plant together with lathes, motors and other machinery. Most of the material, consisting of jewels, gold, etc., were locked in safes at the time and were found to be intact. About fifty hands were thrown out of employment. The plant will be rebuilt. Aurele M. Gatti, president of the company, is now in Porto Rico, where he is looking after his other factory.—C. A. L.

PITTSBURGH, PA.

FEBRUARY 1, 1927.

A spotty atmosphere has existed in the metal industries in Pittsburgh and Western Pennsylvania, during January, due to after holiday lull, inventory taking and the usual January dullness.

The dollar volume of trade during the second week in January, although smaller than in the previous week was greater than a year ago, as measured by check payments. The volume of new building contracts awarded during that week was smaller than in either comparative period. Outside of seasonable merchandise, not much demand is noted for hardware as yet, builders' hardware continuing particularly slow. Jewelry trade also slow. Collections continue to be rather slow.

A better demand is reported for electrical merchandise, and radio trade is quite active.

Employees of the **Hamilton Watch Company,** of Lancaster, Pa., have received a dividend equal to 4 per cent of their wages during 1926. The total bonus distributed in the plant amounted to approximately $80,000. The cash bonus was in addition to the bonuses paid 200 men and women who occupy places on the long service honor roll. During the year the company erected more than 100 homes which were sold to employees at cost.

To observe a demonstration of a metal spraying process for the protection of steel, caused more than 100 Pittsburgh business men to visit the plant of the **Witt Steel Company,** South Greensburg, Pa., recently.

The process is used almost universally in Europe, according to officials of the steel concern. Lead, zinc, tin, copper, or other non-ferrous metals can be deposited on steel or iron articles by means of the process.—H. W. R.

MIDDLE WESTERN STATES

DETROIT, MICH.

FEBRUARY 1, 1927.

Conditions in the non-ferrous metal trade are beginning to show something of an improvement. While most of the plants have been operating in a moderate way it looks now as if they would be under pretty fair productions within the next few weeks.

There does not seem to be much improvement just yet in the production of plumbers' and builders' supplies.

In some instances manufacturing jewelers report business improving, this being particularly true with the **Wallace-Monroe Manufacturing Company.** Representatives of this organization now covering the southwest send in exceedingly favorable reports.

The **Universal Electric Plating Company** has recently been incorporated in Detroit, with offices at 1354 Buhl building. It will manufacture and deal in plating materials and also do plating.

The Detroit district, according to **Harry Grevnin,** president of the **National Smelting and Refining Company,** is one of the largest consuming centers of metal scrap in the world. Some of the most modern smelting plants are located in this territory where the product is smelted, refined and sold to local manufacturers. The value of such reclaimed metal runs into many millions of dollars annually. Much of it is consumed by

the motor car plants. Just now this industry is showing a decided improvement.

William M. **Rule**, general manager of the **Michigan Copper & Brass Company**, is optimistic regarding general business conditions. In an interview with a representative of THE METAL INDUSTRY, he said that the first three months of 1927 as he sees things, will be good. The remainder of the year is a little too far away for a definite forecast, but, he adds, there is nothing in the office to indicate anything but good business for many months to come. "I firmly believe," he says, "the brass industry will be fully as good during 1927 as it was in 1926."

Frank H. **Hoffman** of the **Detroit Copper & Brass Rolling Mills**, who has watched the trend of business conditions for many years, says he is not worrying about what is going to happen in 1927. "It is going to be a good year," he adds. "There is nothing to fear and why should any one be fearful if there is nothing in sight or out of sight to cause it. The new year will be just as favorable to us all as the past year has been."

Wolverine Brass Works, Grand Rapids, 650 men, has about the same amount of orders ahead as last year with good prospects. Total volume for 1927 may be affected by the slowing up in building trade.

Great Western Smelting & Refining Company, Detroit, smelters, 50 employes, report more orders on hand and of better quality at the beginning of the year than at the beginning of last year. Prospects for first half of next year considered better than for previous year.

The **Mueller Brass Company**, of Port Huron, running a thousand men, had its banner year of business in 1926, its volume being 25.5 per cent ahead of 1925, which was its previous banner year. It has better than a million and a quarter of orders ahead for the first two quarters and will be in the market for that period for lumber, lead, zinc, and non-ferrous scrap.

Kendrick Manufacturing Company, brass foundries, Detroit, report booked orders as about 10 per cent less than at the beginning of last year and prospects for first and second quarters for 1927 not as good.

American Brass & Iron Company, Detroit, 50 employes, has been moving into rented space awaiting construction of a new two-story factory and foundry in northeast Detroit, which will commence February 1 and will cost $75,000, giving 50 per cent more capacity. Under conditions its orders ahead are 10 per cent less than a year ago. Inquiries have been light for two months, but have started coming in well lately.—F. J. H.

MILWAUKEE, WIS.

FEBRUARY 1, 1927.

The outlook of the metal industry in the Chicago and Milwaukee territory during the next few months appears bright. Employment has been more constant during the past six months than at any previous time, reflecting the general prosperity of the district. Banks in this territory have just issued yearly reports showing that the average per capita savings are larger.

Working conditions in the brass and copper industry in this territory are very good with every indication of continuing. Most of the foundries report a steady demand for finished products and seem to think that this good business condition will continue through the winter and spring.

The **Blackhawk Metal Company**, 218-24th street, Rock Island, Ill., has been incorporated for $10,000 and will deal in copper, brass and metal. Incorporators are: Lillian Brady, Bertha Brady and Charles Brady.

The **B. Coleman Silver Company**, Chicago, has increased its stock from $50,000 to $100,000. B. Coleman, president, reports that the firm has had a very large year, and that with the larger capitalization will likewise expand its total volume of business for 1927.

The **Ideal Metal Plating Company** has been established at Random Lake, Wis., and has installed complete equipment for plating and refinishing gold, silver, nickel, copper and bronze metals. **George A. Rosenhauer** and **H. A. Sagemuhl** are the proprietors. According to the two men they believe that they will be able to make much progress in their business by locating in this small Wisconsin town, which has good shipping facilities and which is very close to Milwaukee.

The **Monarch Brass Company** has been incorporated at Milwaukee, Wis., for $18,000 and will deal in gold, silver, brass, nickel, copper and bronze metals. Leo K. Bruckman, Emil Plautz and Henry Theis are the incorporators.

The **Badger Metal Corporation**, located at 24th and Vliet street, Milwaukee, Wis., has been dissolved. The firm handled brass, silver, copper and bronze metals.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

JANUARY 17, 1927.

At a conference of members of the jewelry trade in Birmingham yesterday mention was made of the big falling off in the number of students at the jewelers' school from 960 in 1913 to 257 in 1926. A revival in the jewelry trade was predicted by the Lord Mayor, who thought that with a revival of the general industry in the country there would be a revival in the jewelry trade. Other speakers urged the claims of the jewelers' school and regretted that of the 1,000 jewelry firms in the city only 37 were sending students at the present time.

The Birmingham brass trade was fortunate in being able to maintain production fairly consistently throughout 1926. Rolling mills were not brought to a standstill and in many of the brass foundries there were fairly good orders throughout the year. Full employment, however, was not the rule and the plant was often only in partial operation. Those departments which depended upon the engineering industry were slack for the most part, but substantial support was derived from new housing schemes, particularly those in which steel construction was employed. New labor saving houses and small villas offered a wide scope to the manufacturer of gas and electric fittings and metal furniture. Brass pressings found many new applications and special plants were installed in a number of factories for their production.

The metallic bedstead trade had a disappointing year, though the last quarter showed some improvement in the export department. The home trade, however, has not been in proportion to the activity displayed in overtaking the housing shortage and the competition from wooden bedsteads is assumed to be as keen as ever. Though the fuel shortage was acute it does not appear that at any time production actually ceased on account of the lack of fuel for the foundries. Some bedstead factories in Birmingham have installed electroplating apparatus. Good orders have been received during the year for hospital bedsteads and among the novelties which have been introduced are composite bedsteads like the berths of a ship to provide the maximum sleeping quarters for small houses as well as folding bedsteads, some of them on the principle of the railway sleeping saloon with the same object of making the most of a small room. The new year is expected to bring improving business, although manufacturers have to contend with very severe competition from foreign makers who have the advantage of protective tariffs.

The manufacturers of copper and brass tubes and fittings look to the revival in shipbuilding for expansion in their own business. But it will be some time before the effect of this can be felt as their products are among the last required in the equipment of vessels. A great deal of reconstruction and rebuilding of business premises, shops and arcades is taking place in Birmingham and other large towns, and Midland makers of ornamental bronze fittings for decorative purposes have substantial orders in hand. The motor industry also called for large supplies of brass castings.

Makers of plumbers' and builders' brasswork report a falling off in business during last month in supplies not only to the home but to the export market. It is hoped, however, that the new year will bring considerable expansion. Most of the big metal rolling firms have substantial orders to ensure operations at the mills until the end of March. Makers of fancy metal goods had the usual pre-Christmas rush, but anything like the normal volume of trade has not yet returned.—J. H.

Business Items–Verified

Empire Nickel Works, Troy, N. Y., have removed their plant from Seventh avenue and Middleburgh street, to a new one-story building, 25 ft. x 125 ft., at 2709 Sixth avenue.

The **Standard Parts Company,** Cleveland, Ohio, which has been in receivership for the past four years, has liquidated all of its properties and is no longer operating. All of its organization has been disbanded.

Keystone Silver Company, New York, has increased its capital from $25,000 to $75,000. This firm operates the following departments: tool room, spinning, plating, stamping, soldering, polishing, lacquering.

Dallas Brass & Copper Company, Chicago, Ill., has appointed the **J. C. Miller Company** at Grand Rapids, Mich., as agents in that vicinity, covering the territory for a distance of fifty to seventy-five miles from Grand Rapids.

Sun Rise Lamp Manufacturing Company, Inc., New York, manufacturer of lighting fixtures and accessories, has consolidated its plants located at 33 Bleecker street and 351 Canal street in their new premises at 632 Broadway.

The **National-Harris Wire Company,** Newark, N. J., has been formed by a combination of the Harris Alloys, Inc., National Alloyed Metals Company and the Murray-Harris Wire Company. Francis R. Harris is president.

The **Saxon Manufacturing Company,** Huntington, W. Va., is housed in the building at Eighth avenue and First street. At the outset the company is expected to employ approximately 20 or 25 men and increases in personnel will be made according to development.

The **Saxon Manufacturing Company,** Bridgeport, Conn., will move its plant in Huntington, W. Va. This company will make metal products. Raw materials required are steel, brass and Monel metal. Departments operated are: spinning, japanning, stamping, soldering, polishing and lacquering.

The **Dahlquist Manufacturing Company,** 36 West Third street, South Boston, Mass., coppersmith, has awarded contract for the erection of a two-story and basement addition. This firm operates the following departments: cutting-up shop, galvanizing, brazing, tinning, soldering, polishing, lacquering.

Grabler Manufacturing Company, 6565 Broadway, Cleveland, Ohio, manufacturer of metal specialties, will construct a one-story addition. Estimated cost $40,000. This firm operates the following departments: brass foundry, tool room, grinding room, casting shop, galvanizing, plating, stamping, polishing.

The **Wayne Company,** Canal street, Fort Wayne, Ind., manufacturer of gasoline pumping equipment, has awarded a general contract for a one-story addition, 40 x 300 ft., to cost in excess of $85,000 with equipment. This firm operates the following departments: brass machine shop, tool room, grinding room, galvanizing.

The **Niagara Falls Smelting and Refining Corporation,** Buffalo, N. Y., announces the establishment of a Chicago warehouse stock of alloys and products at the Soo Terminal Warehouse. Orders can be placed with John Kramer, 304 Home avenue, Oak Park, Ill., or Rogers Brown & Crocker Brothers, 1964 McCormick Building.

International Combustion Engineering Corporation announces its removal with its American subsidiaries, Combustion Engineering Corporation, Ladd Water Tube Boiler Company and Raymond Brothers Impact Pulverizer Company, Inc., to the International Combustion Building, Madison Avenue corners 35th to 36th streets, New York.

Weidenmiller Die Manufacturing Company, 4311 Lincoln avenue, Chicago, Ill., manufacturer of brass and steel dies, aluminum sugar wafer plates, etc., awarded contract for the construction of a three-story, 46 x 125 ft. factory at 5315-17 Ravenswood avenue. Estimated cost $45,000. This firm operates the following departments: brass, bronze and aluminum foundry.

Botfield Refractories Company, Philadelphia, Pa., has appointed the following concerns as distributors for its product, Adamant fire brick cement: Southern Steel & Cement Company, Asheville, N. C.; Henry A. Petter Supply Company, Paducah, Ky.; Columbia Supply Company, 823 West Gervais street, Columbia, S. C.; Spartanburg Mill Supply Company, 218 Ezell street, Spartanburg, S. C.

The **Royal Metal Company,** 2318 South Western avenue, Chicago, Ill., manufacturer of factory stools and other metal furniture, has purchased property at Michigan City, Ind., where a one-story factory is being erected, containing 50,000 sq. ft. of floor space. Irving Salomon is president. This firm operates the following departments: tool room, plating, japanning, stamping, polishing, lacquering.

The **C. & G. Foundry and Pattern Works,** 1026 Kentucky avenue, Indianapolis, Ind., manufacturers of brass, bronze and aluminum castings, have purchased the plant and real estate of the Enterprise Foundry Company, Twenty-fifth and Yandes streets. The latter will be operated as a gray iron foundry. Charles J. Gisler is president and general manager. This firm will operate the following departments: brass, bronze and aluminum foundry.

E. Reed Burns Manufacturing Corporation, with offices at 27 Jackson street, Brooklyn, N. Y., and branch factories at Chicago, Ill., and Cleveland, Ohio, has commenced the remodeling of the original three-story building at 40-42 Withers street, where the business was first started almost forty years ago. The building, when completed, will afford additional storage space for stocks of polishing compounds, as well as increased facilities for the production of Black Inked Buffs in the manufacture of which this company is specializing.

On November 1, 1926, the **Air Reduction Company,** Inc., acquired through a long term lease from the **Commercial Acetylene Supply Company, Inc.,** the plants and business of that company on the Pacific Coast. The two acetylene manufacturing plants thus taken over, located respectively at Berkeley and Los Angeles, Cal., enable the Air Reduction Sales Company to render the same complete service to industry in that territory that it renders elsewhere throughout the country. This nation-wide service is now accomplished through the agency of 54 plants and 177 warehouses.

The **Sproat Brass Foundry Company** has entered into an agreement with the Long Beach Iron Works for the use of three acres of its seven-acre plot on Anaheim road for the erection, jointly with the Long Beach firm, of a large plant of steel construction, according to Samuel Sproat, president of the **Ward Heater Company,** 1241 South Hopet street, Los Angeles, Cal. Erection of the new plant has resulted from a contract made with the Long Beach Iron Works under which the Sproat Brass Foundry, a subsidiary of the heater firm, will supply the Long Beach concern with all its brass tubing, rods, castings and all other brass to be used during 1927.

INCORPORATIONS

Announcement has been made that the business heretofore conducted by **G. A. Rossberg** and **H. J. Snyder** under the title of Rossberg & Snyder has been incorporated. The name of the new corporation is **Rossberg & Snyder, Inc.,** Philadelphia, Pa.

Royal Metal Manufacturing Company, Chicago, Ill., has been incorporated with $34,091 capital in Indiana.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	$70	$71
American Hardware Corporation	$100	82	84
Anaconda Copper	50	47¼	47½
Bristol Brass	25	4	8
International Nickel, com.	25	40	40½
International Nickel, pfd.	100	104	105
International Silver, com.	100	108	108½
International Silver, pfd.	100	105	107
National Enameling & Stamping	100	25	26
National Enameling & Stamping, pfd	100	81	83
National Lead Company, com.	100	161	163
National Lead Company, pfd.	100	117½	118½
New Jersey Zinc	100	184	186
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company (new)	..	64	66
Yale & Towne Mfg. Company (new)	..	71½	72

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

FEBRUARY 1, 1927.

January business developed some rather spotty tendencies. The mills manufacturing brass and copper, rod, sheet, tube and wire all seemed to be in the position of having some departments very busy and others very slow. There appeared to be very little similarity in the conditions as between one mill and another. For example, in sheet copper, one or two mills were very busy, and others were complaining that they were short of orders, and this condition extended to other departments with practically all the mills anxious for business to round out their order books.

The weakness in the price of ingot copper has no doubt some effect in causing this condition, as many consumers are holding their orders until the last minute, waiting for further reductions in price. Price schedules were reduced in the early part of January and as the month closed it appeared that in view of the softness of ingot quotations another reduction was probable.

In the building trade, at least on the Atlantic coast, the weather has been something of a factor in curtailing consumption of sheet copper. It is expected that in a month or two outside work will again be under way, and operations will be improved to a great extent. There is some doubt as to whether suburban building will be continued on so large a scale as that on which it was conducted last year, but there is no fear of a heavy slump. It is felt that in this line a fairly satisfactory business will be done.

Manufacturers of electric refrigerators have started production on a moderate basis, and are staging a vigorous sales campaign. Reports from the industry are optimistic. Copper sheet and tube and also Monel metal sheets are used extensively in the manufacture of both household refrigerators and ice cream cabinets. Therefore, the producers of Monel metal together with the mills that have been furnishing the copper are looking hopefully to this line for orders which will justify the optimistic predictions that are made.

Some very large orders for nickel and Monel metal have been placed for new construction work in chemical plants and hotels. Producers of these metals are in a position somewhat better than the copper mills, as the order books are well filled and business is coming in good volume. The new developments in the application of Monel metal and nickel to various lines of industry are responsible for this condition to a large degree, and this, together with the continued extension of activity in established fields, has kept up a strong demand with the resulting satisfactory order book condition.

There is no marked degree of pessimism felt throughout the industry generally and all are confidently looking forward to a resumption of buying on a scale which will fill up the mills with business in a short time.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON of D. Houston & Company, Metal Brokers, New York

COPPER

FEBRUARY 1, 1927.

New records were made by the copper industry during 1926, production and domestic consumption, taking deliveries for the latter as the basis of calculation, being the greatest ever attained. The United States refineries produced last year the enormous quantity of 2,880,908,000 pounds, compared with 2,704,618,000 pounds during the previous year, an increase of 176,290,000 pounds. Total deliveries of refined copper to the home trade in 1926 amounted to 1,804,348,000 pounds, against 1,662,342,000 pounds in 1925, being an increase of 142,006,000 pounds.

Domestic and foreign demand recently has been unusually quiet. Local and European markets both were soft and yielding and reflected an erratic and uncertain tendency. Business was done during the first half of January at 13¼c. delivered to Connecticut points, and some selling was reported at 13⅛c. on domestic orders. The market was still dragging bottom at close of month, with sellers at 13⅛c. delivered to Connecticut points. Consumers are holding off pending developments, with the trend indicating a 13-cent level.

ZINC

Market conditions for zinc developed easier tendencies lately. During the last half of January the price of prime Western declined to 6.40c. East St. Louis. This quotation compares with the low of 6.70c. in 1926. London declines had a depressing effect on the domestic market and foreign weakness was the signal for going slow here. At the lower level of prices a short time ago, consumers showed more interest and followed it up by substantial purchases. Subsequent sagging of market, however, discouraged buyers operating heavily for the time being. American consumption was on an enormous scale last year, but the prospects at present are not so bright for a record demand in 1927. The large increase in stocks of 7,405 tons in December was an indication that production was stepping along at a too lively rate for the good of the market. Output in December amounted to 56,884 tons, and was the largest monthly production in 1926. Deliveries for that month were 49,478 tons and stocks at smelters on January 1 amounted to 21,887 tons, compared with 9,295 tons on January 1, 1926. Although surplus stocks are not considered excessively great, the belief is that a speedy reduction in output is necessary to put the market in a favorable condition.

TIN

The feature in tin has been the pronounced decline in price since the beginning of the year. The easier position of the market, as compared with the extremely high price level in the last four months of 1926, created more active domestic buying. Lately consumers bought heavily for nearby and forward deliveries. Liquidation of holdings during the closing days of the month appeared to be responsible for the free offerings at declining prices. But this factor gave American consumers the opportunity to cover requirements on a substantial scale.

The complete figures of tin exports from the Federated Malay States for 1926 amounted to 45,946 tons, as compared with 45,925 tons for 1925, a gain of only 21 tons. Consumption of tin has exceeded production for many months. It is conceivable that this will continue to be the basis for abnormally high prices. Domestic demand was specially active during the closing days of January, with heavy sales for all positions up to and including the month of June. February and March deliveries were favored at 64.75c. for first half of February and 64.37½c. and 64.50c. for March deliveries.

These prices compare with 67c. for February and 67.62½c. for spot Straits a few weeks ago. Prompt tin is in good supply and the premium for spot delivery has shrunk to less than 1c. per pound. There was an advance of £5 10s. 0d. in price of Straits tin at London on January 31, and market here on same date was firm at 64.75c. to 65.50c. for February delivery. A substantial reduction in world visible supply is indicated when January statistics are completed.

LEAD

Both the domestic and foreign markets for lead declined during January. Liberal surplus supplies, expanding output and a cautious attitude on the part of consumers have combined to weaken values. During the past month the downward tendency was marked in sympathy with lower London advices and other features which exerted an adverse influence on the situation. The New York price declined from 7.80c. to 7.40c. There were three price reductions by the leading producer. Considering the great volume of consumption expected to develop in this country and Europe in 1927, a better buying movement would soon change the tone and trend of the market. The trend of the local market has been steadily downward for the past five months, and it is natural to expect that the lower levels should interest the consuming industry. Demand was on a fair scale lately, but not urgent enough to result in higher values as the month closed. World production of lead in 1926 was reported at 1,463,135 tons, and compared with the reported output for 1925 of 1,272,056 tons.

ALUMINUM

Recent price reductions brought out some buying, but demand, generally speaking, has not been specially active. The lower prices are interesting chiefly as evidence of increased production facilities, heavy importations, keener competition and more or less uncertainty regarding future prices. It is difficult to believe, however, that consumption will suffer any serious setback, and there is plenty of evidence that output will be at an expanding rate. Imports of aluminum for the first eleven months of 1926 (the latest available statistics) amounted to 67,185,483 pounds, against 32,542,777 pounds for the first eleven months of 1925. Current prices are quoted at 26c. for 99 per cent plus virgin ingot and 25c. for metallurgical 94-99 per cent metal.

ANTIMONY

The antimony market has registered considerable improvement since the first of the year. Trading was on a fairly active scale lately for arrival here between now and April. Prices firmed up during the last half of January, with business reported at 13.87½c. and 14c. duty paid for March and April arrival. The spot price has advanced to 14¼c.@14½c. duty paid, f.o.b. New York. There has been an increasing consuming demand, and with the uncertain conditions in China buyers have been more anxious to secure supplies. Imports of antimony during 1926 amounted to 29,422,026 pounds, against 21,318,090 pounds in 1925 and 14,552,130 pounds in 1924. The motor car and radio, as well as other lines of industry, have contributed to the increased demand for this metal.

SILVER

Silver prices during the past month have advanced and reacted frequently, but the present price of 58¼ cents per ounce compares with 53¾ cents early in January. The price touched 59⅝c a short time ago in response to stronger advices from London. Speculative movements at this stage set in for Chinese account and prices again declined. India was a recent buyer on a limited scale, but China selling offset buying orders. India demand last year decreased over 14 per cent from the figures of the two preceding years. China, however, increased its takings in order to build up reserves and for payment of military troops.

QUICKSILVER

Increased domestic consumption of quicksilver has been showing itself for several months, and this feature has helped to lift prices to the present high level of $102.50 to $103 per flask. Despite record imports into this country in 1926 of approximately 28,226 flasks, market values are maintained on a firm basis. New requirements have come into view, and sellers regard the situation as consistent with prevailing conditions.

PLATINUM

The platinum market is now easier than it was a month ago, with the refined grade quoted at $102 per ounce. The demand has not been particularly active of late and this fact has tended to the recession in price. Reports of supplies in South Africa and of the discovery of a substitute metal have been current in trade circles.

OLD METALS

The movement of scrap metals lately has been on a quiet scale for domestic account, but export demand has held up in good volume. Supplies abroad are comparatively small and good, clean brass and copper scrap material has found a ready outlet at recent prices. Market values are low enough to attract buyers, and the outlook is for substantial requirement from England and the Continent. Holders are apparently in position to carry stocks if necessary, and if demand is somewhat poor in one direction it is more active at other centers. Quotations dealers pay are quoted at 10c.@10¼c. for heavy copper, 8¾c.@9c. for light copper, 6¼c.@6½c. for heavy brass, 8½c.@8¾c. for new brass clippings, 5¾c. for heavy lead, 3¼c.@4c. for old zinc, and 18½c.@19c. for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1926, 14.188—January, 1927, 13.375.
Brass Mill Zinc—Average for 1926, 7.783—January, 1927, 7.10.

Daily Metal Prices for the Month of January, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	3	4	5	6	7	10	11	12	13	14	17	18
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	13.375	13.375	13.25	13.25	13.25	13.25	13.25	13.375	13.375	13.50	13.45	13.45
Electrolytic	13.125	13.125	13.00	13.00	13.00	13.00	13.125	13.125	13.25	13.25	13.25	13.25
Casting	12.625	12.625	12.625	12.625	12.625	12.70	12.70	12.75	12.875	12.875	12.80	12.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	7.00	7.00	6.925	6.925	6.925	6.90	6.85	6.80	6.75	6.70	6.675	6.55
Brass Special	7.05	7.05	7.00	7.00	7.00	6.95	6.90	6.875	6.825	6.775	6.75	6.625
Tin (f. o. b., N. Y.) c/lb. Duty Free												
Straits	67.625	67.125	66.75	67.00	67.25	67.625	66.75	67.125	67.125	67.00	67.25	66.50
Fig 99%	65.75	65.375	65.00	64.875	65.25	65.625	64.75	65.25	65.25	65.25	65.625	65.00
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.65	7.625	7.60	7.50	7.50	7.50	7.50	7.50	7.45	7.45	7.475	7.475
Aluminum c/lb. Duty 5c/lb	27	27	27	27	27	27	27	27	27	27	27	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	13.00	13.00	13.00	13.375	14.00	13.75	13.75	13.625	13.625	13.75	14.50	14.25
Silver c/oz. Troy Duty Free	54.00	53.75	53.625	54.125	53.875	54.50	55.00	54.875	55.75	55.75	55.875	55.875
Platinum $/oz. Troy Duty Free	107	107	107	107	107	107	106	106	104.50	104.50	104.50	104.50

	19	20	21	24	25	26	27	28	31	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	13.45	13.375	13.375	13.375	13.375	13.375	13.375	13.375	13.25	13.50	13.25	13.356
Electrolytic	13.25	13.125	13.125	13.125	13.125	13.125	13.125	13.125	13.00	13.25	13.00	13.125
Casting	12.75	12.80	12.80	12.80	12.80	12.80	12.80	12.80	12.75	12.875	12.625	12.746
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.50	6.55	6.525	6.45	6.40	6.50	6.475	6.50	6.525	7.00	6.40	6.687
Brass Special	6.55	6.60	6.55	6.525	6.475	6.55	6.525	6.55	6.575	7.05	6.475	6.748
Tin (f. o. b., N. Y.) c/lb. Duty Free												
Straits	66.50	66.625	66.125	65.50	65.25	65.375	65.125	64.875	65.375	67.625	64.875	66.470
Fig 99%	64.875	65.125	64.75	64.50	64.00	64.00	63.50	63.125	63.50	65.75	63.125	64.780
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.475	7.35	7.35	7.30	7.25	7.225	7.225	7.225	7.20	7.65	7.20	7.420
Aluminum c/lb. Duty 5c/lb	26	26	26	26	26	26	26	26	26	27	26	26.524
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	14.25	14.25	14.25	14.50	14.50	14.50	14.50	14.50	14.50	14.50	13.00	13.970
Silver c/oz. Troy Duty Free	55.875	56.50	56.50	56.75	56.25	56.50	57.625	57.625	58.625	58.625	53.625	55.679
Platinum $/oz. Troy Duty Free	104.50	103	103	103	103	103	103	103	102	107	102	104.738

Metal Prices, February 7, 1927

NEW METALS

Copper: Lake, 12.70. Electrolytic, 12.375. Casting, 12.35.
Zinc: Prime Western, 6.60. Brass Special, 6.65.
Tin: Straits, 68.75. Pig, 99%, 66.25.
Lead: 7.225. **Aluminum,** 26.00. **Antimony,** 15.125.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flash, 75 lbs. $103.00. Bismuth, $2.70 to $2.75.
Cadmium, 60. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 59.125.
Gold, oz., Troy, $20.67. **Platinum,** oz., Troy, $102.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10 to11
Brass Ingots, Red	11½to12¾
Bronze Ingots	11½to12¾
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	13 to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	18⅞to22½
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guaranteed 5%	70 to80
Phosphor Tin, no guarantee	70 to80
Silicon Copper, 10%....according to quantity...	30 to36

OLD METALS

Buying Prices		Selling Prices
10¾to11¼	Heavy Cut Copper	12¼to12¾
10½to11	Copper Wire	12 to12¼
9 to 9½	Light Copper	10½to10¾
8¼to 8½	Heavy Machine Composition	9¾to10
7 to 7¼	Heavy Brass	8½to 8¾
6 to 6¼	Light Brass	7¼to 7½
7 to 7½	No. 1 Yellow Brass Turnings	8¾to 9¼
8 to 8½	No. 1 Composition Turnings	9¾to10¼
6 to 6¼	Heavy Lead	7 to 7¼
4¼to 4½	Zinc Scrap	5¼to 5¾
10 to11	Scrap Aluminum Turnings	13 to15
14½to15	Scrap Aluminum, cast alloyed	18 to19
20 to20½	Scrap Aluminum, sheet (new)	22½to23
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	20½c. to 21½c. net base
From stock	21½c. to 22½c. net base

BARE COPPER WIRE

15c. to 15¼c. net base, in carload lots.

COPPER SEAMLESS TUBING

23½c. to 24½c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	20 c. net base
100 lbs. to 200 lbs. in one order	20½c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carlod lots, standard sizes and gauges, at mill, less 8 per cent discount	11.00 net base
Casks, jobbers' price	12.25 net base
Open Casks, jobbers' price	12.75 to 13.00 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	38c.
Aluminum coils, 24 ga., base price	34.7c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Hot Rolled Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c or over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 60½ to 62½.

BRASS MATERIAL—MILL SHIPMENTS

In effect February 1, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.17⅞	$0.19⅜	$0.21⅜
Wire	.18⅜	.19⅞	.21⅞
Rod	.15⅝	.20⅛	.22⅛
Brazed tubing	.25⅞	.....	.31⅛
Open seam tubing	.25⅞	.....	.31⅛
Angles and channels	.28⅞	.....	.34⅛

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

22¾c to 23¾c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19⅞c. net base
Muntz or Yellow Metal Sheathing (14"x48")	17⅞c. net base
Muntz or Yellow Rectangular sheet other Sheathing	18⅞c. net base
Muntz or Yellow Metal Rod	15⅞c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	25¾c.	10% Quality	28¼c.
15% "	27¼c.	15% "	32½c.
18% "	22½c.	18% "	35¾c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Hot Rolled Sheets (base)	42
Cold Drawn Rods (base)	43	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c, over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, February 7, 1927

ANODES

Copper: Cast	20¼c. per lb.	**Nickel:** 90-92%	45c. per lb.
Rolled	20⅜c. per lb.	95-97%	47c. per lb.
Electrolytic	20¾c. per lb.	99%	49c. per lb.
Brass: Cast	19¼c. per lb.	**Silver:** Rolled silver anodes .999 fine are quoted from 62½c. to 64½c. per Troy ounce, depending upon quantity purchased.	
Rolled	20⅜c. per lb.		
Zinc: Cast	14 c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$26.30-28.85
14" 20 ply 64/68 Unbleached	33.85-35.90
12" 20 ply 80/92 Unbleached	28.35
14" 20 ply 80/92 Unbleached	38.40
12" 20 ply 84/92 Unbleached	33.05-40.50
14" 20 ply 84/92 Unbleached	44.80-54.20
12" 20 ply 80/84 Unbleached	35.40-36.50
14" 20 ply 80/84 Unbleached	48.00-49.15

Sewed Pieced Buffs, per lb., bleached 60-75c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12½	Iron, Sulphate (Copperas), bbl.	lb.	.01½
Acid—Boric (Boracic) Crystals	lb.	.12	Lead Acetate (Sugar of Lead)	lb.	.13¾
Chromic	lb.	.32	Yellow Oxide (Litharge)	lb.	.12½
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02	Mercury Bichloride (Corrosive Sublimate)	lb.	$1.21
Hydrochloric, C. P., 20 deg., carboys	lb.	.06	Nickel—Carbonate dry, bbls.	lb.	.29
Hydrofluoric, 30%, bbls.	lb.	.08	Chloride, bbls.	lb.	.17-.21
Nitric, 36 deg., carboys	lb.	.06	Salts, single 300 lb. bbls.	lb.	.10½
Nitric, 42 deg., carboys	lb.	.07	Salts, double 425 lb. bbls.	lb.	.10
Sulphuric, 66 deg., carboys	lb.	.02	Paraffin	lb.	.05-.06
Alcohol—Butyl	lb.	.18½-.23	Phosphorus—Duty free, according to quantity		.35-.40
Denatured, bbls.	gal.	.44	Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¼
Alum—Lump, Barrels	lb.	.03¼	Potassium Bichromate, casks (crystals)	lb.	.08½
Powdered, Barrels	lb.	.042	Carbonate, 96-98%	lb.	.07
Aluminum sulphate, commercial tech.	lb.	.02⅜	Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Aluminum chloride solution in carboys	lb.	.06½	Pumice, ground, bbls.	lb.	.02½
Ammonium—Sulphate, tech. bbls.	lb.	.03¾	Quartz, powdered	ton	$30.00
Sulphocyanide	lb.	.65	Rosin, bbls.	lb.	.04½
Arsenic, white, kegs	lb.	.05	Rouge, nickel, 100 lb. lots	lb.	.25
Asphaltum	lb.	.35	Silver and Gold	lb.	.65
Benzol, pure	gal.	.60	Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½	Silver Chloride, dry	oz.	.86
Calcium Carbonate (Precipitated Chalk)	lb.	.04	Cyanide (fluctuating)	oz.	.60
Carbon Bisulphide, Drums	lb.	.06	Nitrate, 100 ounce lots	oz.	.42½
Chrome Green, bbls.	lb.	.29	Soda Ash, 58%, bbls.	lb.	.02½
Chromic Sulphate	lb.	.37	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Copper—Acetate (Verdegris)	lb.	.37	Hyposulphite, kegs	lb.	.04
Carbonate, bbls.	lb.	.17	Nitrate, tech., bbls.	lb.	.04¼
Cyanide (100 lb. kegs)	lb.	.50	Phosphate, tech., bbls.	lb.	.03¾
Sulphate, bbls.	lb.	.05½	Silicate (Water Glass), bbls.	lb.	.02
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27	Sulpho Cyanide	lb.	.45
Crocus	lb.	.15	Sulphur (Brimstone), bbls.	lb.	.02
Dextrin	lb.	.05-.08	Tin Chloride, 100 lb. kegs	lb.	.46½
Emery Flour	lb.	.06	Tripoli, Powdered	lb.	.03
Flint, powdered	ton	$30.00	Wax—Bees, white ref. bleached	lb.	.60
Fluor-spar (Calcic fluoride)	ton	$75.00	Yellow, No. 1	lb.	.45
Fusel Oil	gal.	$4.45	Whiting, Bolted	lb.	.02½-.06
Gold Chloride	oz.	$14.00	Zinc, Carbonate, bbls.	lb.	.11-.12
Gum—Sandarac	lb.	.26	Chloride, casks	lb.	.06¾
Shellac	lb.	.59-.61	Cyanide (100 lb. kegs)	lb.	.41
			Sulphate, bbls.	lb.	.03½